The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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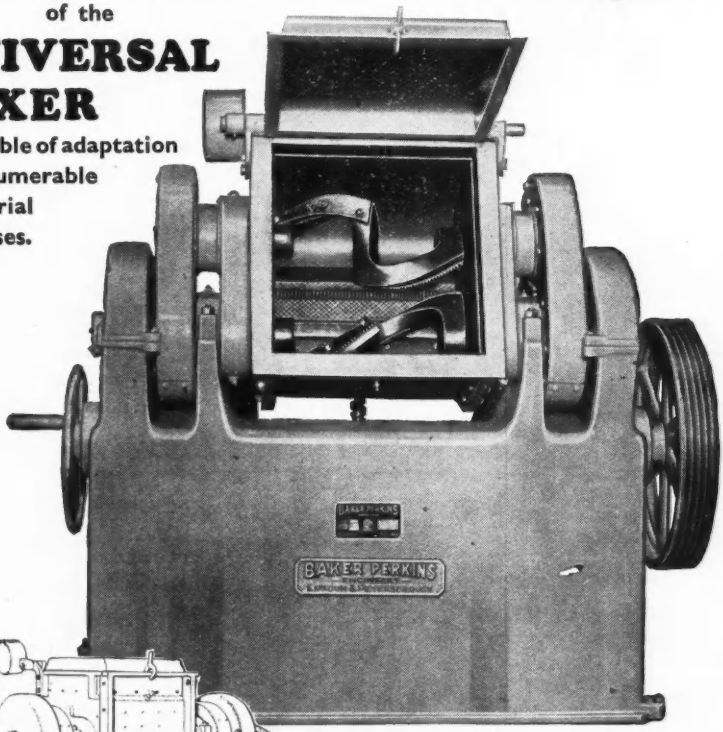

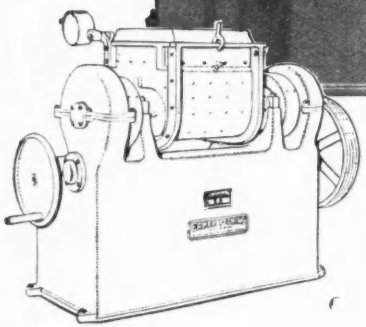

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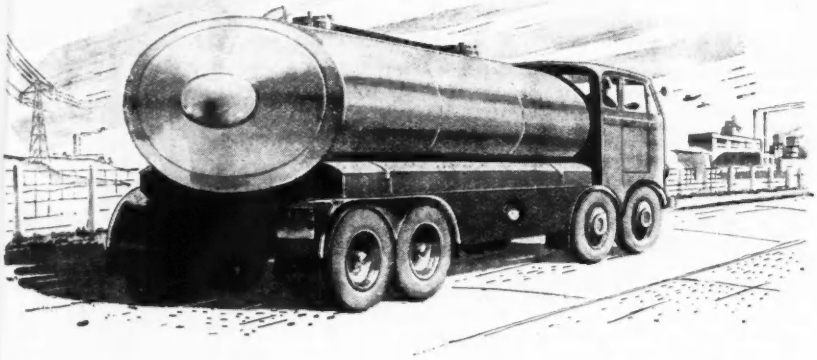

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Costs and Costing

DURING the war most firms were living in a fool's paradise. Cost did not matter; production was everything. It is easy enough to get very high rates of production if no attention need be paid to the cost. In the 1914-18 war the then Minister of Munitions showed how production could be stepped up in a quite remarkable way by the outpouring of unlimited amounts of money. The "cost-plus" system which was used so largely during the late war, but which was condemned by committees of inquiry, did not encourage production costs to be kept down to the lowest figure; quite the reverse. Even where there was a cost investigation the comparison was not made between a particular works and the "bogey" costs for efficient production; the only criterion appeared to be whether in fact legitimate costs were incorporated in the manufacturing charges.

This phase has passed, and although we are still in a sellers' market, we are coming back to competitive standards. Cost of materials has increased as a result of the war; cost of fuel has at least doubled; cost of labour has increased and is still increasing. How are these increased production costs to be met? Should they be met by increasing the selling price of the goods? That is a way in which the colliery industry has met their increased costs for labour and materials. The result of such a policy, however, can only be that those who have to pay more for commodities will themselves ask for higher wages in order to meet the increased cost and this will lead to general inflation. We are, in fact, already in an inflatory spiral. It has been pointed out that the way to meet the increased cost of coal is to use it more efficiently; this is one basis of the fuel efficiency campaign. The same belief, however, is true generally and the way to meet increased cost is through greater production efficiency. This may mean improved technical efficiency. The experience of the Fuel Efficiency Committee of the Ministry of Fuel and Power in regard to the use of coal has shown that very great increases in the efficiency with which coal and steam are used are possible in most factories, and this has led to the suspicion that similar economies can be made in other technical directions. That is a matter which concerns the technical staffs, chemical engineers, and production managers generally. It raises also the question of the yardstick by which production efficiency can be measured. Should it be

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consumption of raw materials per unit of product, or cost of labour per unit of product? The answer we suggest is that what is needed is an effective system of costing, sometimes called "cost-accounting." We dislike the term "cost accounting" and we prefer simply to call the operation "costing."

There is between the engineer and the accountant a long rivalry. The accountant exercises his craft to produce documents which are often unintelligible to the engineer, and with which the engineer profoundly disagrees. The engineer, often with every justification, holds that no accountant can successfully cost industrial operations unless he understands what is going on. If costing is to be done successfully, either the accountant must have sufficient technical knowledge of manufacturing processes to understand them, or the technician and the accountant must work together. Joint and co-operative working is probably the ideal. The lay-out and organisation of a costing system is a matter for expert advice, because much money can be wasted on costing. Essential information must be assembled; that is a matter which may involve heavy costs if it is not handled properly. In the extreme case, the works operations are built round the costing system. When that happens, and the costing system becomes the master and not the servant, an impossible situation arises which may lead to disaster. Costing should be applied to ascertain the necessary factors in the cost of manufacture, without devoting overmuch care to minor items that are without real influence. Costing is a tool, just as chemical analysis is a tool. Both are necessary if production is to be efficient, but neither should dominate production.

It is surprising how few engineers know their production costs in any detail. It is also surprising to find how few engineers include all relevant items in their costing. To some extent this is due to a mistaken idea on the part of employers that costs should never be disclosed. As one writer has put it: "In Britain we have tended to treat cost figures as being of a 'top-secret' nature." Many managers of companies refuse to let their production engineers know their costs. This, of course, is foolish, because if an engineer does not know how the final cost of his product is built up, he does not know where to look for economies. It is about as sensible as telling an engineer that he must produce goods to a specification, but refusing him access to the analyst's figures. Cost figures must not be used simply as a stick to beat the production man; if they are used in that way their value is reduced to something very small. They must be used as the basis for informed discussion as to where improvements can be made.

The degree to which costing should be carried depends on circumstances. Much depends upon the objective. The straightforward methods of accountancy will be sufficient in the first place, the ultimate cost of the product being obtained in terms of materials, steam, fuel, power, labour, maintenance, repairs, depreciation, overheads, and so forth. Where the same product is being made day after day, that should be sufficient to show where the major costs fall. But it may be necessary to analyse certain items of these costs in more detail, and this may involve a full-scale efficiency test to provide the figures. Obviously cost analysis can be carried to any desired extent according to the labour and expense that can be permitted to get the necessary figures. Costing by the straightforward methods of normal accountancy will be found to be of great value, provided that the figures are given to the man in charge and discussed by him and the accountant. We understand that the Ministry of Fuel and Power has in course of publication a bulletin on costing which should be of the greatest value to those who have not hitherto given much thought to the subject.

Cost analysis can go farther than this, however. The methods of statistical analysis can be applied to costing. Much useful information is contained in data which cannot be uncovered by the normal accountancy methods and which require statistical methods for their extraction. There are many factors which can disturb the normal production costs: mistakes, breakdowns, abnormal waste, errors, variations in quality of raw material, etc., and as a result the costs per unit taken at repeated intervals over a period do not lie on a straight line. Statistical analysis is necessary to interpret these variations. Engineers can learn to use this method, but it is best that they should leave it to the accountant, and devote their energies to the practical problems of production.

We thus arrive at the conclusion—with which everyone may not agree—that the engineer should collect the data and should collaborate with the accountant in working

it out by the usual methods. The accountant, however, should be responsible for the further analysis of the figures, and his conclusions should be discussed with the engineer, who will be able to say at once whether they are reasonable and practical or not. The collection of a reasonable amount of data for cost analysis is at least as important as the collection of samples for chemical analysis. Data from the costing department must be handled in precisely the same way as data from the laboratory, namely, communicated to those whom it concerns on the production side and used by them in collaboration with the management to reduce costs in order to offset the increasing prices of raw materials and the increasing cost of labour.

NOTES AND COMMENTS

"Britain Can Make It"

JUDGED by the daily attendances of the public, the "Britain Can Make It" exhibition at the Victoria and Albert Museum, London, has proved an undoubted success, and many will welcome the announcement that the closing date has been extended until December 31. At the same time, there will be a certain amount of disappointment over the decision to dismantle the exhibition then, instead of sending it on tour. This will be especially the feeling in Scotland, whose claims were pressed particularly. However, the Council of Industrial Design, who organised the exhibition, point out that March is the latest suitable date for a showing in Scotland and, to go to Glasgow, the exhibition would have to close in London on November 24 since dismantling and re-erection would require more than three months. The cost of moving and administering the exhibition for a month might well reach £150,000, and very substantial amounts of timber and fabric would be needed for renewals. Similar considerations affect any proposal to move the exhibition to a provincial centre in England or Wales. By remaining open in London until the end of 1946, the exhibition could not open elsewhere until the end of April, nine months after the date when most goods were submitted, and a few weeks before the opening of the British Industries Fair, when the exhibition would have lost its interest for manufacturers, and home and overseas buyers. It is hoped to make arrangements later on with the railways for the running of special excursions from Scotland and provincial centres. The technical difficulties, the cost involved, and the inevitable lapse of time are considered too great to justify the Government in sending the exhibition overseas. A welcome innovation is that as from next week the exhibition will be closed to the public on Friday mornings so that directors, managers, and buyers of industrial and commercial establishments can obtain admission on presentation of their business cards, from 9.15 a.m. onwards.

Radio and Science

ONE of the questions discussed at the Royal Society's Empire Scientific Conference in July was the dissemination of scientific information (*see* THE CHEMICAL AGE, July 13, p. 33). The stress then was on the manner in which scientific news is presented by the Press, criticism being expressed regarding the development by certain scientific publications of a "slang" almost unintelligible to experts and completely so to laymen. Another aspect of the same question—the publicising of science by radio—gave rise to an interesting discussion at a recent meeting of the London and South-Eastern Counties Section of the Royal Institute of Chemistry. Dr. W. E. van Heyningen claimed that the necessity for publicising or popularising science had existed long before the atomic bomb, which had only accentuated it and made a wider circle of scientists aware of their responsibilities to society. The atomic bomb and other wartime developments had made science unpopular in certain circles, he said, and to that extent antagonism as well as ignorance must be overcome. It was suggested that satisfactory science broadcasting would be attained only when the B.B.C. (a) appointed a full-time Director of Science Broadcasts, responsible for long-range strategy, and understanding all aspects of science, including its social function, and having the confidence of his fellow-scientists and of the public; (b) retained a consulting panel of specialists; and (c) employed a staff of producers devoting full time to science broadcasts. The general feeling of the meeting was that the

scope of the broadcasts should be as wide as possible and that they should be simple in style and expression.

The Mind of a Machine

AN electronic brain, capable of carrying out functions such as the semi-automatic parts of the human brain perform for us, certainly strikes us as a "Wellsian" conception. But the stage is already set for its development, according to Admiral Lord Mountbatten of Burma who, speaking as president of the British Institution of Radio Engineers at the twenty-first anniversary dinner, described its possibilities. This robot with a mind of its own would, of course, be operated by radio valves, activating each other in the manner of cells. An example of such a machine is the electronic numeral integrator and computor—Eniac—which is worked by 18,000 valves. A machine of this kind receives information from a number of systems and, functioning in accordance with overall directions given to it by human beings—even from a distance—is claimed to be capable of providing solutions of abstruse mathematical problems in a fraction of the time which would be taken by a human mathematician. Machines are in use which go even further and, it is claimed, exercise a degree of memory, while others are being devised which are expected to be capable of making a choice and coming to a judgment. With such mechanical phenomena in prospect, science would certainly seem to be facing a new revolution; and Lord Louis was not exaggerating when he spoke of the responsibilities confronting scientists as "formidable and serious."

Nearly Human

THIS latest machine can with certainty be called a robot. It deserves the name more than the machines of metal built in grotesque human form, which for years have been one of the sights of pseudo-scientific exhibitions. These metal machines could only move their limbs, in response to commands; they could not think, nor could they remember. They had no brain. But the new man-made mind is truly a robot in that it is obedient and intelligent, and, alas, completely impersonal. It is claimed that the machine can play a mediocre game of chess. If this claim is put forward to show its human side, it is an unfortunate choice. Everyone knows chess to be a methodical, cold and passionless game. It is a game where the human emotions are never aroused. If it had been said that the machine could hold its own in a cut-throat poker school, or give some aid to a harassed penny pools contestant, then people would have welcomed it, and acclaimed it almost human. As it is, because of its extra-human powers in coldly solving fantastic mathematical problems we hope it may be able to give some help to the Chancellor of the Exchequer in working out the extent of our national debt.

Peanuts in East Africa

BRITAIN'S chemical and paint industries may benefit if the proposal to produce ground nuts on a large scale in East Africa is approved by the Government and is carried through. Oil from these nuts will be used to eke out the world supply of edible fats. Industry will benefit indirectly through the release to it of certain other oils, *e.g.*, linseed oil, which are at present being used as food owing to the shortage of fats. The project for the production of ground nuts in East Africa was put forward by a commission which was appointed by the Colonial Office four or five months ago to survey the prospects of cultivating such a crop in certain parts of the British Empire. They reported "extremely promising" prospects for East Africa, and suggested that if quick action were taken it might be possible to reap the first harvest next year. Because large capital expenditure would be required to launch the scheme, it was suggested that the British Government should finance it. The project is a long-term one, as it is not considered there is much likelihood of a fall in demand for vegetable oils for a considerable time. If the scheme goes through, ground nuts will be grown in Tanganyika, Rhodesia, and Kenya, in addition to Nigeria, which has hitherto been the chief colonial source of the nuts.

The first all-aluminium bridge span in history has been installed on the new Grasse River bridge of the Massena Terminal Railroad at Massena, New York. It was designed by the Aluminium Company of America and built entirely of Alcoa aluminium alloys. The 100-ft. span weighs only 53,000 lb., as compared with 128,000 lb. for similar steel spans.

Growth-Regulating Substances

Their Chemistry and Development

by T. SWARBRICK, M.A., Ph.D.*

GROWTH-REGULATING substances are not mysterious vital forces, they are definite chemical materials. For our present purpose which is to stress the chemical aspects of this new scientific development, a growth regulating substance may be defined as "a substance which although present in minute amount, has specific influences upon the growth and differentiation of living tissues, thereby controlling their subsequent development in some way other than by direct nutritive means."

Particular emphasis must be placed upon two important factors in this definition. The first is the small amount of active substance that is required to produce the ultimate response. At first sight it might appear that some sort of enzyme action is involved, but this is not so, for, it is recognised, an enzyme merely accelerates the speed of a reaction that will proceed slowly without it. But with growth-regulating substances it is different; without them there is chaos, with them organised growth and development proceeds. The amount required must usually be reckoned in parts per million. An excess may be as harmful as complete absence. The second factor is that we are concerned with the effect of substances upon the development of the living organism. These substances lose all their importance as soon as the organism is dead. When present, they direct living processes along the familiar channels.

Chemical Analysis Problems

It is precisely at this point that the main difficulty of our investigation lies. It is both difficult and costly to examine large quantities of complex plant and animal material for the presence of unknown substances which at most are present at one or two parts per million. Furthermore, there are no known methods of direct chemical analysis for many of the substances known to act as growth regulators. Biological assay is the only method at present available and even this must be used with caution. In view of the many difficulties and the fact that it was not until 1910 that the first heat-stable plant-growth regulating substance was isolated and its effect demonstrated, our advance has been phenomenal. It is now known that there are over one hundred chemicals which can act as plant-growth regulators, and the number is increasing as more workers turn their attention to this new field of knowledge.

* Of the Shell Petroleum Co., Ltd., London.

The majority of the known plant-growth regulating substances fall into a fairly well-defined group of organic compounds, but there are notable exceptions. The "naturally" occurring substances are the various indole and phenyl compounds while the synthetic ones are mainly substituted benzoic acid and phenoxy compounds. The most notable exception to this general list is a synthetic œstrogen, dihydroxy-diethyl stilbene, which does not contain either a carboxyl group or chlorine, and only one double bond.

Surface Phenomena

It is not surprising that various theories have been advanced to account for the observed physiological activity of these numerous substances. Unfortunately no one single theory will account for all the known phenomena, and it is the present writer's considered opinion that chemistry alone does not provide the answer to our problem. It was mentioned earlier that these substances are important only so long as the plant is alive, and therefore capable of responding to the stimulus. It is becoming increasingly clear that living processes are essentially surface phenomena, that is the various reactions take place at solid/liquid or immiscible liquid interfaces. The production of a satisfactory theory must therefore wait upon the advancement of our knowledge of orientated reactions taking place within the peculiar conditions that prevail in surface layers, as distinct from chemical reactions taking place *in vitro*. In fact, we are here concerned not so much with the composition of the molecule as its shape, its molecular weight, its spatial configuration, and its polarity or free electrical energy.

The importance of molecular shape, or isomerism, as distinct from percentage composition can be illustrated by the following examples. The substance 2-4 dichlorophenoxy acetic acid is highly physiologically active. Using young tomato plants about 6 in. high, the presence of this material can be detected down to one part in ten million parts of water. A further refinement in technique should enable us to detect even lower concentrations. At one or two parts per million 2-4 D. (as it is known) will induce the parthenocarpic development of unfertilised tomato flowers. At one hundred parts per million it will induce undesirable "formative" effects, and at one thousand parts per million it is lethal to a wide range of plants, while others are hardly affected at all. Because of this

latter quality, 2-4 D. has now become the basis of what are known as "differential" weed-killers, and one firm alone in the U.S.A. has this year manufactured and sold over three million pounds of 2-4 D. for use as a weed-killer—sufficient for the treatment of three million acres of land. In England, I.C.I. have developed a modification of 2-4 D. which is now marketed under the trade name of Agroxone. The active chemical in this preparation is 2-methyl 4-chloro phenoxy acetic acid. The production of this material instead of the 2-4 D. is no doubt prompted by the fact that it can be made from facilities and raw materials available in England. But from our present point of view the important fact is that the substitution of a methyl group for the chlorine atom in the "two" position on the ring does not materially alter its physiological activity. But 2-chloro 4-methyl phenoxy acetic acid, produced by substituting the chlorine in the "four" position by a methyl group, is physiologically almost inactive. It is certainly not nearly such a good weed-killer as the 2-methyl 4-chloro material. Both these substances have the same chemical composition but a different spatial arrangement, and very different properties.

Effect of Related Chemicals

That it is no longer possible to look to chemistry alone for an understanding of our problem is also shown by the fact that α naphthalene acetic acid will prevent pre-harvest fruit drop when applied to fruit trees at 10-15 p.p.m by an effect upon the abscission layer, whereas β-naphthalene acetic acid is useless for this purpose. Furthermore, increasing the dose rate beyond this amount does not increase the response. Similarly, α-naphthalene acetic acid will inhibit the sprouting of potatoes so that they can be stored well into summer without risk of deterioration from sprouting. The β-compound is almost useless for this purpose. Storage methods based on the use of α-naphthalene acetic acid and costing about 8d. per cwt. are now commercial practice in the U.S.A. and Holland, but for some reason have not been adopted in England in spite of the fact that some of the original work on which this method is based was done in this country by the writer during the early war period. For the parthenocarpic production of tomatoes, β-naphthoxy-acetic acid is highly effective, whereas the α-compound is useless. Examples could be multiplied almost indefinitely but the high physiological activity of the γ-isomers of DDT and Gammexane may be mentioned.

Furthermore, it is well known to workers in this field that if the acid, *e.g.*, α-naphthalene acetic acid, is physiologically active, then the potassium, sodium, and ammonium salts, the methyl and ethyl esters, the amides, and frequently the nitriles, will also be physiologically active, but will require to be used at higher concentrations in order to compensate for their higher molecular weight. The fact that the salts, esters, and amides of a particular nucleus are physiologically active has important applications in commerce. The potassium, sodium, and ammonium salts are water-soluble, the esters are soluble in organic solvents and mineral oils, and the amides are more easily compounded in dust, etc. The manufacturer can therefore choose a form suitable for his particular purpose.

These considerations raise the whole question of "specificity" as regards insecticides, fungicides, and plant-growth regulating substances. The introduction of DDT has done more than anything to focus our attention on the problem of specificity, and intensive research is in progress all over the world to uncover the nature of this action. In fact, conservative entomologists and chemists regard DDT as the first of a whole series of new chemicals that will be "specific" against a particular insect or narrow group of insects. Indeed, materials are now being developed in the U.S.A. which are reported to be active against certain insects at lower concentrations than DDT at its best. Even DDT shows marked specificity. Two recent cases must suffice. There are apparently two races of asparagus beetle in the U.S.A. which the insect taxonomists cannot distinguish with certainty. One is easily controlled by DDT, the other is not. DDT does not control the Mexican Bean beetle yet this pest is easily controlled by a slightly modified DDT molecule. Indeed this latter material, which is still undergoing trial in the U.S.A., is the first one to offer any real promise of commercial development for the control of this important pest.

Molecular Structure

Recent research by the writer has also served to emphasis the importance of shape and the free energy relationships of the molecule as distinct from its percentage chemical composition. It was found that the synthetic œstrogen, dihydroxy diethyl stilbene, will induce the parthenocarpic production of tomato fruits. In this respect it falls into the same class as the chlorine-substituted phenoxy compounds.

From the theoretical standpoint this is an important observation since stilbœstrol is a symmetrical molecule, contains two phenolic OH groups, and does not contain a carboxyl group nor any chlorine. In fact, except for the two OH groups in the phenolic position it is a hydrocarbon, and in this respect it is very much like the indole and phenyl compounds which were the first plant-growth regulating substances to be isolated from plant material. It is interesting to note that since the writer pointed out that di-

hydroxy diethyl stilbene could be used as a plant-growth regulating substance, American workers have shown that the methyl and ethyl esters are also physiologically active. The material, therefore, in this respect, falls into line with other growth-regulating substances.

What are the important practical aspects of growth-regulating substances? Many famous botanists, *e.g.*, Sachs, Darwin, Loeb, and others all postulated the existence of "root-forming," "stem-forming," and "flower-forming" substances without being able to isolate or demonstrate them. Now we have over one hundred chemicals each of which can be used for a specific purpose. But of these only a few can be used commercially because we have not yet learnt how to formulate the majority for this purpose. Much of the difficulty lies in the specific nature of the response they engender, and in the determination of the proper concentration at which to use them. Take root development, for an example. The most versatile single substance for this purpose is indole butyric acid, yet for rooting evergreens (holly and privet, etc.) α-naphthalene acetic acid is the best single substance. Recent research, however, shows that for the most satisfactory results a mixture of two or more substances is required, but the problem is: which materials and in what proportions? Until we can get a better understanding of the physiology of these materials, the right proportions must be determined by the laborious method of trial and error. Mixtures of substances are also indicated in other branches of the work. It is well known that α-naphthalene acetic acid is the only satisfactory material for the prevention of pre-harvest fruit drop. Some varieties of apple, however, have a short period of duration of effect, but recent research has shown that in those varieties the effective period may be prolonged by the use of a second substance at not more than 5 parts per million. Commercial growers may therefore expect improved commercial formulations in the near future when these experiments are concluded.

Undesirable Changes

The undesirable effects of 2-4 D., when applied to tomato plants at concentrations of 100 p.p.m. or more, have been mentioned earlier. 2-3-5-tri-iodobenzoic acid also has somewhat similar effects which require further study. This substance, when vaporised in the presence of young tomato plants, causes the subsequent shoots which arise in the leaf axils to be flower shoots instead of leafy shoots. 2-3-5-tri-iodobenzoic acid is in fact the first "flower-forming" substance shown to be specific for this purpose. Even this material cannot yet be formulated for use on a commercial scale, but it points the way to future developments.

More far reaching still is the possible connection between growth-regulating substances, virus diseases, vitamins, and the oxidation-reduction systems of the living organism. It was mentioned earlier that living processes are controlled oxidation-reduction processes taking place within a surface membrane. Growth regulating substances are somehow involved in these systems and it is interesting to note in passing that many of the substances known to be growth regulators will act as oxygen or hydrogen acceptors or donators depending upon the conditions in which they find themselves. It is only recently that the substances associated with virus diseases have been isolated in a pure state, and it will be interesting to see what these materials are chemically.

Toxin Similarity

The boundary line between plant physiology, plant pathology, organic chemistry, and colloidal physics is rapidly disappearing. Even in plant pathology it has been shown that the disastrous and economically serious consequences of certain pathogenic organisms are due to small quantities of the "toxins" or by-products which they produce. When these toxins are rendered inactive by the use of some chemical with which they will combine to form an innocuous substance, the plant shows no symptoms of disease despite the presence of the pathogen. Certain quinone compounds have proved particularly effective for this purpose, and active research in now in progress to discover other materials that are more satisfactory. The quinones are known to be active oxygen acceptors or donators depending upon their immediate environment.

Our present knowledge of the chemistry and physiology of growth-regulating substances is at best scanty and there are many large gaps. I have tried to indicate that the subject is part of a much larger whole involving the fields of enzyme activity, vitamins, virus diseases, the physical basis of inheritance, and even cancer research. A new science is developing which will require the active co-operation of animal and plant physiologists in association with biochemists and those rare souls who study the spatial relationships of atoms and molecules, and the orientation of molecules in a surface layer. Much of this work must remain for the present on a highly academic level, but in the meantime the chemical industry in England can contribute to our future welfare by recognising that developments along these lines may well be as revolutionary as those that have recently taken place in physics.

The Mysore Government has placed contracts in Britain for industrial equipment to the value of £500,000

The Skoda Works

Progress of Reconstruction Reviewed

(by a Special Correspondent)

INTERESTING details have just come to hand about the results achieved in the reconstruction of the well-known Skoda Works at Plzen (Pilsen), one of the leading units in Czechoslovakia's heavy industry, and, at the same time, one of the foremost producers of armaments and machinery of every description on the Continent.

It may be recalled that the Skoda Works were heavily bombed in the last phase of the war; in particular, the raid of April 24, 1945, in the course of which over 1000 heavy and medium bombs and some 16,000 fire bombs were dropped, had such serious consequences that only about 40 per cent of the factory buildings remained intact. Reconstruction work was put in hand immediately Plzen had been liberated by United States forces. The extent of the work may be gauged from the fact that in the second half of last year about 4745 tons of iron, 870 tons of cement and 1,320,000 bricks were used, while 3,183 trucks of scrap were removed from the ruins. In order to hasten the resumption of activities, the works staff put in over 100,000 hours of voluntary labour. As early as the first half of July, *i.e.*, two months after the city had been liberated, the reconstructed electrical foundry was again in operation and the first steel was made. The next step was the starting up of the Siemens-Martin furnaces. As a result of the resumption of output in the steel plants, work in other manufacturing departments of the concern could be started. By the end of the year, 75 per cent of essential repair work at Plzen was completed.

Further Progress

At the same time progress was made in the branch factories and subsidiary companies. For instance, the plant at Prague-Smichov, which had not been damaged at all during the war, is now fully engaged on the manufacture of Diesel engines and machine tools. The plant at Brno, which suffered severely during the siege of the town, is turning out electric equipment and the plant at Adamov, the greater part of which was ruined, has also been repaired so that the production of railway brakes and of machine tools for the Skoda works could be resumed. The factory at Hradec Kralove, in Bohemia, exclusively used for the production of war equipment, has been converted to the manufacture of industrial equipment, such as boilers and machinery for sugar plants, breweries, alcohol distilleries, as well as plant for the chemical industry. Another factory at Plotiste is employed in the manufacture of dairy equipment.

In the first four months of 1946 the electrical equipment plant at Doudlevce produced nearly 10,500 electro-motors and about 100 transformers, while in some of its branches the pre-war production level was gained by March, 1946. In Slovakia, the works at Dubnica, which had been completely destroyed by the retreating Germans, were reconstructed, by May last, to such an extent that the manufacture of materials for the construction of railway and road bridges could be begun. Later, the production of machinery was added to the plant's manufacturing programme. The shipyards at Komarno on the Danube are reported to be fully employed in the building of barges and other river craft. It is stated they will be fully employed for a long time to come.

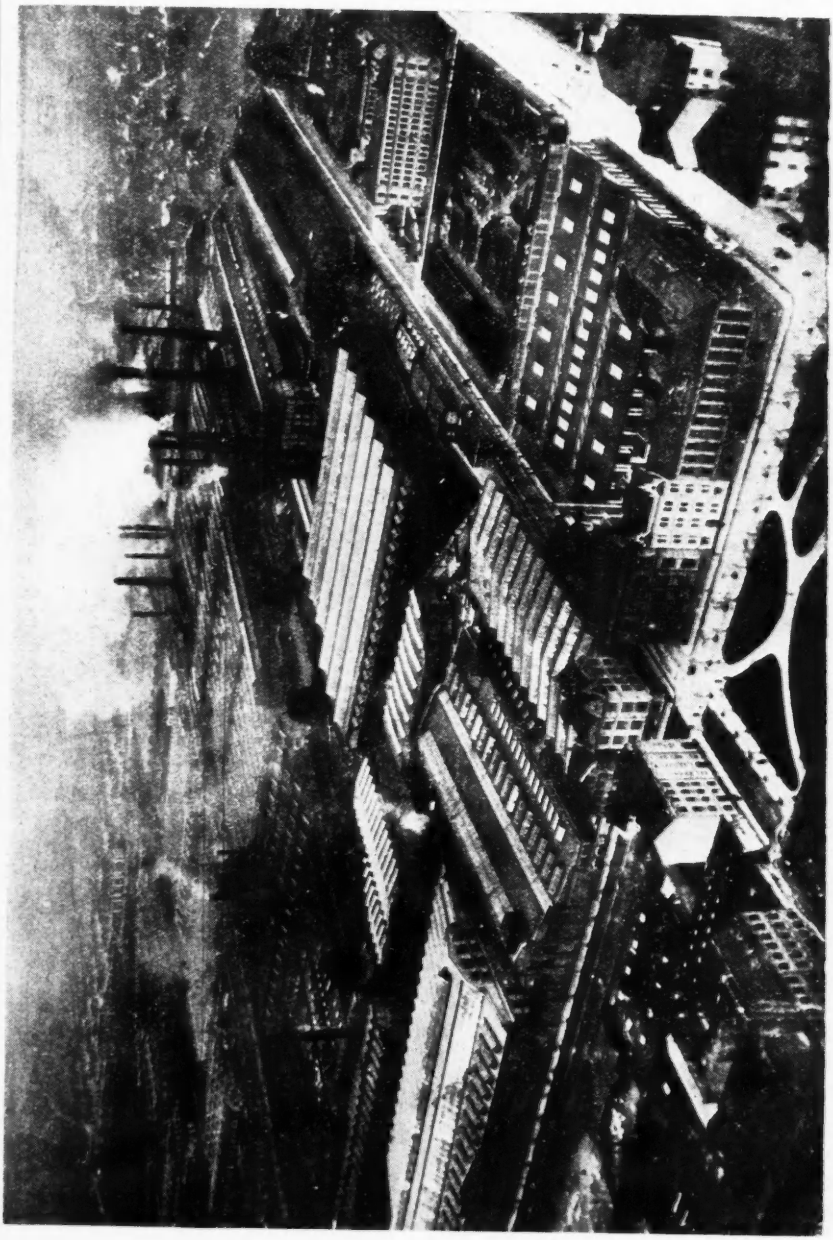
Expansion

Another important unit of the Skoda concern, the locomotive shop, which had been the target of every air raid, has not only been rebuilt, but expanded. At the beginning of this year, it produced a locomotive wholly manufactured in Czechoslovakia. According to recent advices, 47 new locomotives had been built up to the middle of August, a fact which should be of no mean importance in the reconstruction of the Central European transport system.

As regards the manufacture of machinery, an important field of activity of the Skoda Works, it is reported that a large number of items can again be supplied, while the motor car works have designed a new model, the Skoda 1101 and a new tractor, the Skoda UT28.

Employment in the Skoda Works—which have been nationalised by a decree of the Ministry of Industry of March 7, 1946—is reported to be satisfactory and orders continue to come in at an increasing rate, including inquiries from abroad. The financial position of the concern, about which no details are available as yet, appears to be strong.

A photograph of the Skoda Works, as they were seen from the air at the beginning of the war, is on the opposite page.



Digest of Statistics

Chemical and Allied Production and Consumption

PRODUCTION and consumption of various chemicals and fertilisers in the U.K. during August, as recorded in the October issue of the *Digest of Statistics* (H.M.S.O., 2s. 6d. net), showed much fluctuation. Figures quoted represent thousand tons.

Production of sulphuric acid—*i.e.*, as 70 per cent acid and including acid made at Government factories—was 150.4, a drop of 6.2 from the July figure, and of 10.9 from that for June. Consumption of sulphur for the manufacture of sulphuric acid, at 15.7, was also down from 16.6 in July, and 17.0 in June. After rising in July to 159.0 from the June figure of 152.0, consumption of sulphuric acid declined again to 154.0. Stocks of sulphur for the manufacture of sulphuric acid rose to 68.6, as compared with 56.7 for July, and 58.1 for June. Sulphuric acid stocks, however, continued to fall, the figure being 88.7 as against 89.6 and 92.7 respectively for the preceding two months.

More Superphosphate

Superphosphate production, at 75.0, showed an increase again of 1.7 over July's figure, which had dropped by 1.8 from that for June. Consumption of superphosphate, including deliveries to consumers and amounts used in compounds, was also up, the figure being 83.7, as compared with 76.1 in July, and 64.8 in June. A recovery in production of compound fertilisers, which had fallen to 80.9 and 91.7 in June and July respectively, was shown in the figure of 112.3. The increased consumption was maintained at 55.9, comparing with the previous month's rise to 53.4 from 18.9 in June. There was a rise of 4.6 in the consumption of phosphate rock for fertilisers over the July figure (54.9), which had risen by 4.5 from the preceding month's. Consumption of ammonia, including both home deliveries and export, but excluding ammonia produced in by-product factories and converted directly into ammonium sulphate, was down to 23.34 from 24.29 in July and 25.51 in June. Stocks at 4.68 were again up from 3.44 in July and 3.11 in June.

In September there was another rise in the production of iron ore, the figure being 229.0, as compared with 224.0 for August and 220.0 for July. Pig iron production in September was level again with the July figure of 147.0, which had dropped by 2.0 in August. There was also a rise in the production of steel ingots and castings which, after falling to 226.0 in July and August, were up to 238.0.

Among non-ferrous metals, total disposals of virgin copper in August were 25.0, as against 26.1 in July and 23.7 in June. August stocks, at 85.1, had risen by 1.8 since July and by 4.2 since June. Disposals of virgin zinc totalled 16.7, a drop of 1.1 on the July figure, which had risen from June's total of 17.1. Consumption of zinc concentrates was down to 11.6, following July's decline of 3.2 from the June figure of 16.9; but stocks, totalling 118.0, had risen from 109.0 in July, though still below the June total of 125.0. A figure of 16.1, as compared with 17.8 in July and 16.4 in June, represented total disposals of refined lead, of which stocks amounted to 27.1, after dropping from 33.7 in June to 23.0 in July. A fall of 1.8 was shown in the total disposals of tin metal, which had risen in July to 3.97 from June's total of 2.63. Comparative figures for stocks were: August, 22.1; July, 20.0; June, 22.4.

An upward trend in the number of people employed in chemical and allied works was again indicated by the total (in thousands) for August of 231.6 (including 73.8 females) as compared with July's figure of 226.7, which had fallen off by comparison with 227.8 in June, when the first improvement in seven months was shown.

World's Largest Transparent Plastic Dome

A crystal-clear dome, 11 ft. in diameter and 4½ ft. deep, made of plastic—acclaimed the world's largest transparent "bubble"—has recently been completed in America by the E. L. Cournand Co., New York, after four months' experimenting and engineering.

A heated sheet of Rohm and Haas Plexiglas, the plastic from which noses of war bombers were made, was drawn into a vacuum pot to the required shape and cooled. Before a sufficiently large sheet could be obtained several sheets had to be joined with a bond strong enough to withstand the vacuum and the stretching. Heat-welded and cementing in an ordinary butt joint had failed. Success was achieved by routing a concave V-groove in both edges of the sheets to be joined, soaking a cast acrylic rod in monomeric methacrylate cement, and placing the softened rod between the grooved edges. The hemisphere was then mounted in an 11-ft. steel ring, allowing for expansion or contraction of the material in extreme hot or cold weather.

Buffed to a clarity equal to that of the finest optical glass and claimed to retain its shape indefinitely and to be immune to weather, the giant hemisphere is intended to contain an advertising display.

Potash Reclamation

Recovery from Ferrous and Non-Ferrous By-Products

by A. G. AREND

As a result of potash deficits during the recent war, a number of the less vital industries were obliged to abandon their activities temporarily, and consequently a certain amount of attention was given to the problem of balancing this deficiency. Probably the most detailed accounts and statistics are derived from papers issued by the U.S. Division of Fertiliser Chemistry. From a reprint of one of these (1944) it is known that some 85,000 tons were allocated to the chemical industry, while agriculture claimed 540,000 tons; 36,000 tons were delivered in the United Kingdom, and 35,000 tons to Canada.

Although the sources of the raw material are wide and varied, the general development of methods here and in America differs considerably. The recovery of potash from blast-furnace by-products has been more popular here, whereas the reclamation from cement-kiln dust has been much more extensive in the the U.S.A. As it happens, deposits of potash-bearing felspars exist to a quite considerable extent in this country, although, despite numerous proposed processes, comparatively little of this material has been utilised. The variety of felspar known as orthoclase has been known to contain up to 16 per cent K_2O, or 13 per cent actual potassium (although this is the purest variety), and a much greater abundance exists of mineral of lower potash content. From time to time, attention has been attracted to the possibilities of recovering the potash salts, and at the same time converting the remainder to different forms of cement. A list of patents is available on this subject, but it is doubtful whether many of these have been put into regular service.

Flue-Dust Recovery

On the other hand, great success has been attained in the recovery of potash from blast-furnace flue dusts from the smelting of pig-iron, where, although the total percentage is exceedingly minute, the large daily tonnage allows this to accumulate to an appreciable figure. From earlier details, the dust recovered from the Scunthorpe plant is known to contain some 63 per cent of soluble potash salts, mainly composed of bicarbonates and carbonates, although chlorides, cyanides, formates, and sulphates were also detected. Since as much as 5.6 per cent of cyanides were present, the product necessitated careful refinement before it could be fully utilised, to ensure freedom from poisoning hazards, etc. By introducing the electrostatic precipitation process, the Skinningrove plant was enabled to offset this undesirable impurity, but carbonates were absent here, and only traces of sulphates appeared, and the dust, containing some 20 per cent of potassium as chloride, was accompanied by 8 per cent of sodium chloride. By dint of careful handling of the charges and the addition of alkali chloride,, it was claimed that as much as 70-80 per cent of the available potash salts could be volatilised, and upwards of 100 lb. of potassium chloride could be recovered per million cu. ft. of gas from the blast furnaces. The total amount of potash salts originally introduced into the furnace, per ton of pig-iron produced, only amounted to 7.6 lb., in another instance. Further statistics showed that the potash capable of recovery from 100 blast furnaces per annum could amount to some 1670 tons per annum, but the cost of the operations involved was considered to render this doubtfully economical.

Mechanical Handling

Mechanical handling problems in connection with potash have resulted in the connection with potash have resulted in the use of improved forms of equipment at the few blast-furnace plants engaged on this work. Some of the salts concerned are guilty of absorbing moisture from the atmosphere and tend to convert the mass into a sloppy condition.

Even the coarser dust is removed separately from the flues, while the mains leading from the washers, although representing only a small source, have been known to contain upwards of 44.5 per cent potash Instead of giving the material any opportunity to be exposed, the conveyors into which it is discharged are equipped with wheel-mounted covers, which can be opened at any point. The discharge hopper enters into a funnel, and can be slewed so that the best possible use can be made of the existing conveyor line. In the ordinary way, however, trucks are provided with special containers of almost conical shape which are run up to receive the discharged dust, and remove it to the reclamation plant. These containers can be closed at the top, and evenly and uniformly discharged to the tanks from the bottom.

Probably most of the development in potash handling emanates from the old-established potash mines at Strasbourg, where, from long years of experience, the best type of freighter trucks have been designed (Fig. 1). These have a truncated conical top with hinged lid, and means of directly discharging into barges lying on the waterways nearby. In recent years the

conveyor lines used have been fitted with special scraper attachments, so that the plate-belt sections are enabled to have any adhering material pressed into a squared block, and completely thrust off each time the scraper comes into position. Reverting to the blast-furnace process, where spray washers connected to the stoves are used, great care has to be taken that no serious dusting losses are sustained; and recent installations of electrostatic precipitators are claimed to entrap practically all dust with the minimum need for mechanical handling. It will be observed that, as the total of 7.6 lb. of potash is available per ton of pig-iron produced, and the iron ore charge, including lime, brings this down to little more than half this quantity, only some 0.18 per cent of potash is present in the original charge. The work is thus wholly a matter of by-product recovery.

American cement manufacturers are better placed in this respect, since the raw material charged to the kilns contains upwards of 4 per cent of potash, and usually averages 6 per cent, which accounts for the lack of interest in blast-furnace reclamation in that country. Whereas the slags from the furnaces are generally guilty of retaining much of the potash, the cement process frequently permits more liberties, in that alkali chloride additions can increase the available yield. Statistics made out by K. Chance revealed that whereas some 150,000 tons were lost in the slag, only 50,000 tons were actually volatilised with the gases. The meagre proportion of potash initially present prevented attention from being devoted to improved reclamation methods.

A totally different state of affairs exists in the smelting of certain of the non-ferrous metals, particularly copper, where the use of richly siliceous slags supplants the use of the converter. The same applies in a lesser degree to nickel, and to certain of the mixed residues and concentrates smelted. In the ordinary process where a large plant lay-out is engaged, the product from the blast furnace passes to a converter for concentration. Copper matte is thereby raised to crude metallic condition, suitable for conversion to anodes for electrolytic refining. Nickel matte of some 30 per cent nickel is raised to almost pure nickel sulphide of 70 per cent nickel, by a similar process. Mixed concentrates and residues have also been subjected to converter treatment to expel the surplus sulphur, while silver-bearing copper and lead materials are concentrated in a like manner.

Converter plant, however, is justified only where there is a large and constant supply of raw material, and smaller smelters and refiners, besides those engaged in remote localities, have to revert to a slower, though almost equally successful, method of concentration. This comprises roasting the poor matte, and returning the oxidised mass to the blast furnace, together with suitable siliceous fluxes, which for convenience are frequently formed into briquettes. By so doing, even the poorest mattes can be raised to a greatly enriched condition, while the costs are little more than that of fuel and labour.

Even after 1918 poor mattes containing about 8 per cent copper, besides foul slags, were generally ignored as being worthless.

Fig. 1. Specialised types of freighter trucks used at the potash mines at Strasbourg.

One enterprising firm, however, enriched these to as much as 50 per cent copper in a single operation, following suitable roasting. Where argentiferous copper ores are handled, a similar method was developed in Argentina, where the silver was concentrated, and the bulk of the gangue material removed as slag. Siliceous fluxing additions represent the main feature of each of these processes. With silver residues, barren additions are not wanted, and efforts are made to utilise silver-bearing sands as far as possible, so that the furnace performs a dual function. It is here that the use of felspars, particularly those of the orthoclase variety, are of interest, and although their use so far has been somewhat limited, the final washing of the furnace gases permits the volatilised potash salts to be concentrated in the wash-water solution.

Application of Felspar

A typical charge comprises 20 cwt. matte, 6 cwt. selected and finely pulverised felspar, and 3 cwt. slag, with a calculated addition of carbonaceous material to assist the reduction. While this suffices for reverberatory furnace smelting, a binder, besides the usual water-glass, is also added when the material is to be formed into briquettes. Ferruginous lead sulphate deposits from lixiviation tanks are a suitable addition here, and assist the easy production of good briquettes. Much care has to be bestowed on the formation of a suitable ferrous silicate slag, since in this way the potash salts are rendered most volatile. For example, a slag consisting of 32 per cent silica, 36 per cent ferrous oxide, and 32 per cent lime, will melt at about 1150° C., but this does give the potash salts the same opportunity to volatilise. A more refractory slag of less fusible disposition and containing what is generally considered an undesirable material, *viz.*, ferric oxide, instead of part of the ferrous oxide, is used. This slag is viscous, and the lower portions of it have a greater tendency to adhere to some of the matte, so that this section requires to be returned to the furnace for re-smelting; on the other hand, the potash is not retained in the same manner as with the usual type of slag. The high temperature of the blast-furnace under these reducing conditions causes the bulk of the potash salts to pass to the flues and the scrubbing towers. Whereas the iron blast-furnace charge only contained an initial 0.18 per cent of potash, the matte concentration charge contains 3 per cent, let alone any additions obtained from the 3 cwt. of slag, which, if taken from the same process, tends to increase this proportion.

Depending on how the charge is worked, about 80 per cent of the available potash passes to the gases without in any way interfering with the condition of the concentrated matte. If badly worked, the majority of the tapped slag frequently separates into two layers, although this cannot always be detected by the eye, but an analytical test will

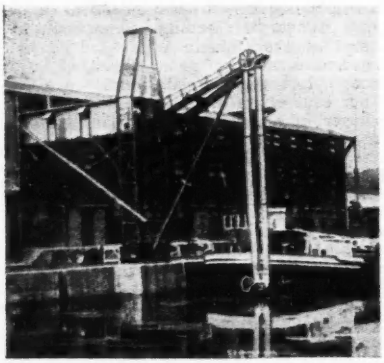


Fig. 2. The earlier type of elevator device is still employed for discharging the barges at Strasbourg.

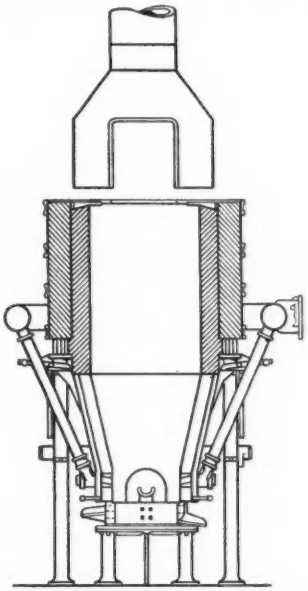


Fig. 3. Design for blast-furnace for non-ferrous metals in which, when potash-bearing fluxes are used, the heat and other conditions are manipulated to volatilise the potash.

reveal that the upper layer is richer in potassium. At the scrubbing towers, instead of utilising a continual flow of fresh water, water from an overhead storage tank is used repeatedly, whereby the dirty liquor becomes more and more concentrated in potash salts as the process proceeds. This liquor is filtered and used for the production of different potassium salts by existing methods.

One of the reasons why less use than might have been expected was made of felspar as a fluxing agent in the past was the fear of glassy, viscous slags, which would be difficult to remove completely from the furnace bottoms. In Sweden, the substitution of electric smelting forestalled this contingency, and it was from this experience that improved methods of manipulating the blast furnace were copied. The removal of the dust by wet-spray, bag-filtration, and electrostatic precipitation, are not so well suited as is a regular scrubbing tower, since the soluble disposition of the material assists separation. Details of recent analytical methods of determining potash appeared in *Ind. Eng. Chem* (*Anal. Ed.*) on October 15, 1943, while particulars of German methods using an acetylene-air mixture and photo-electric cell to give an instant recording of the potash content were ascertained in 1944. On the one hand, the total amount of matte enrichment does not involve a large tonnage as does iron smelting, but the fact that up to twenty times as much potash can be incorporated in the initial charges is a feature worthy of consideration.

Hungary's Chemical Industry

Slow but Successful Recovery

(*from a Special Correspondent*)

SINCE reference was made in THE CHEMICAL AGE of October 12 (*see* p. 450) to the fact that a programme for the production of dyestuffs has recently been put into operation in Hungary, further interesting details about the Hungarian chemical and pharmaceutical industries have been received in this country.

Although the effects of the war, in the final phase of which some very bitter fighting took place in Hungary, are still felt, the chemical industry has staged a slow but successful recovery and its present position is stated to be by no means unfavourable. This is in no small measure due to the elimination, at any rate for the time being, of competition from German chemical firms, as a result of which Hungarian chemical manufacturers hope to be able to take over the markets in the countries of South-Eastern Europe in which Germany held a dominating position before the war.

The recovery achieved so far is illustrated by the fact that in May, 1945, the industry worked with merely 12 per cent of its pre-war productive capacity; at the beginning of the current year, this figure had risen to about 25 per cent, with a subsequent increase to 40 per cent by the end of September. The number of employed has, moreover, already somewhat exceeded the pre-war figure of about 16,000.

As regards the production of industrial chemicals, the well-known Hungaria Chemical Works has maintained its leading position notwithstanding the fact that the Phoenix Works in Nagybánya had to be returned to Roumania. Difficulties in the supply of raw materials and heavy war damage at first handicapped the company's recovery, but remarkable progress has been achieved in the reconstruction of the installations for the production of such important items as copper sulphate, sulphuric acid, hydrochloric acid, and artificial fertilisers, etc. It is hoped that in all these branches of production output will soon reach the pre-war level. The plant for the production of synthetic ammonia of the State Nitrogen Works in Pét was completely destroyed during the war, but the fertiliser plant is in operation, utilising raw materials supplied by Soviet Russia.

The Hungarian pharmaceutical industry has still to cope with manifold difficulties and because all the larger works have suffered war damage through air attacks, as well as loss of machinery and equipment, recovery has progressed less satisfactorily than in the country's heavy chemical industry. Hungary's leading pharmaceutical enterprise, the Chinoin Works, which had an annual turnover of about 25,000,000 Swiss francs before the war, and exported about 60 per cent of its output, has at present a turnover of about 10 per cent of the pre-war figure, while output, on the other hand, is reported to be approximately roughly 50-60 per cent of that of 1938, and large quantities of products are, therefore, manufactured for the replenishment of stocks, both for the home market and for export. It is noteworthy that in the later stages of the war, production of this company increased by about 100 per cent over the pre-war level. Since the end of the war, a number of new pharmaceutical enterprises has been started.

Although the Hungarian chemical industry has still a long way to go before normal conditions are re-established, it is a factor to be reckoned with in post-war Europe.

Oils and Waxes from Coal*

Recent German Work on Catalysts

by Dr. C. C. HALL†

THE Fischer-Tropsch process for the synthesis of hydrocarbons from carbon monoxide and hydrogen, based on a reaction discovered in 1925, was operated in Germany over the period 1939 to 1944 in nine plants, six in the Ruhr area, two in Central Germany, and one in Eastern Germany. The combined rated annual output of these plants was 740,000 tons of total hydrocarbon products, but the maximum output attained was 570,000 tons or rather less than 8 per cent of the total German production of oil (7½ million tons).

The process consisted in preparing a mixture of carbon monoxide and hydrogen in the proportions of 1 to 2 (known as "synthesis gas") which was purified from sulphur compounds and passed over a cobalt catalyst, maintained at a temperature between 180° and 200°C., either at atmospheric pressure or at about 10 atm. pressure (the so-called "medium-pressure" process). The primary hydrocarbon products were separated from the residual gas and divided into fractions for disposal or for conversion into secondary products.

The gasification of hard coke in normal water-gas generators was the main method employed for preparing the synthesis gas, the required ratio of hydrogen to carbon monoxide being obtained either by catalytic conversion to hydrogen of a portion of the water-gas or by adding the hydrogen-rich gas obtained by cracking coke-oven gas in the presence of steam. Two of the plants prepared the synthesis gas by the direct gasification of brown coal. Hydrogen sulphide was removed from the gas by the conventional methods employed in the gas industry, and organic sulphur compounds by passing over alkalised iron oxide at a temperature of 180° to 250°C. The total sulphur content of the gas was reduced by this procedure to about 0.04 grain per 100 cu. ft.

Composition of Catalyst

The synthesis catalyst used in all the plants from 1938 onwards had the composition, in parts by weight: cobalt 100, thorium oxide 5, magnesium oxide 8, kieselguhr 200. It was prepared by precipitation from solutions of the nitrates and reduced in hydrogen for a short period at about 400°C. under carefully controlled conditions. The useful life of the catalyst varied from 3 to 8 months, the cobalt and thorum being recovered from the spent catalyst for use in the preparation of fresh material.

In order to dissipate the heat of the synthesis reaction and to control the temperature within the required range, the catalyst was arranged in narrow spaces between directly or indirectly water-cooled surfaces. For operation at atmospheric pressure, rectangular box-like vessels fitted with horizontal water tubes and vertical steel sheets set about ¼ in. apart were used. For the medium-pressure process the catalyst was placed in the annular spaces between tube plates within a cylindrical shell. The cooling water flowed round the outer tubes and through the inner tubes.

The atmospheric-pressure process was operated in two stages and the medium-pressure process in three stages, the overall space velocity in both cases being about 65 volumes of gas per volume of catalyst space per hour.

Of the nine plants, five operated only at atmospheric pressure, two only at medium pressure and the remaining two used both types of process.

Reaction Products

The reaction products, which were mainly straight-chain paraffins and olefines, were recovered by cooling and adsorption on active carbon. They were fractionated and stabilised by conventional methods. The proportions of the various fractions obtained were as follows:

Per cent by wt.		Atmospheric-Pressure Process	Medium-Pressure Process
C_3 and C_4 hydrocarbons	...	14	10
Fraction, 30—165° C.	...	47	26
" 165—230° C.	...	17	24
" 230—320° C.	...	11	13
Soft Wax, 320—460° C.	...	8	17
Hard Wax, over 460° C.	...	3	10

Irrespective of the pressure used, the most efficient plants obtained yields of 160-165 grammes C_3 and higher hydrocarbons per cubic metre inert-free synthesis gas, *i.e.*, about 80 per cent of the theoretical maximum yield. The highest space-time yield obtained at atmospheric pressure was about 2.2 tons, and at medium pressure 2.4 tons per cu. ft. of reaction space per annum.

The C_3 and C_4 hydrocarbons were liquified by compression and mainly sold as fuel. The fraction 30-165°C. was sold as low-grade petrol for blending purposes, and the 165°-230°C. fraction as high-grade diesel oil for upgrading low-quality tar and petroleum oils. The fraction 230°-320°C. was mainly converted into "Mersol" detergents (used as soap substitutes) by sulpho-chlor-

* From a lecture given to a joint meeting of the Society of Chemical Industry and the Institute of Fuel on November 4.

† Of the Fuel Research Station, D.S.I.R.

ination followed by saponification. A portion of this fraction together with some of the soft wax was cracked to produce olefines, which were polymerised to give good-quality lubricating oils. The bulk of the soft wax was oxidised to produce fatty acids, the main fraction of which was used for soap manufacture, and to a small extent for the production of edible fat. Most of the hard wax was used in the wax industry for polishes, paper impregnation, electrical insulation, etc. Approximately 72 per cent. of the total products was used as liquid fuel and 28 per cent as chemical and special products.

In the most efficient plant only 30 per cent of the total heat input to the process was recovered as primary products, but an additional 25 per cent was recovered as steam and residual gas. The net heat consumed in the production of 1 ton of primary products was equivalent to 4.5 tons of coal (C.V. = 12,600 B.Th.U. per lb.) assuming a thermal efficiency of 90 per cent. for the carbonisation of coal.

On the basis of 10 RM. to the £ sterling, the capital cost of the German plants varied from 450 to 850 RM. per ton annual production, and the operating cost, including capital charges, from 240 to 390 RM. per ton of primary products. The manufacture of the synthesis gas was the major item of cost in the process.

Latest Developments

In the last two years of the war, German research work was largely concerned with developing an iron catalyst which would replace cobalt in the existing plants, due to shortages of cobalt, but the general trend of war-time research in this field was towards the production of olefines, waxes or alcohols for use in the chemical field rather than products for fuel use only. Some advances were made along these lines with cobalt catalysts, but most attention had been paid to iron catalysts, which were found to be most flexible with respect both to operating conditions and nature of products.

Other developments in the synthesis process were the production of iso-butane using mixed-oxide catalysts at 450°C., and 300 atm. pressure, and the synthesis of waxes of very high molecular weight using a ruthenium catalyst at 200°C. and 100 atm. or higher pressure. None of these developments promised much, if any, improvement in efficiency or reduction in the cost of the process.

The most important development arising from the study of product utilisation was the "Oxo" synthesis in which olefines react with carbon monoxide and hydrogen to form aldehydes. Although developed for the production of long-chain alcohols from Fischer-Tropsch olefines this process is of general applicability to compounds containing ethylenic linkages.

Based on the operation of the more efficient German plants, it is estimated that the production of the primary products under present-day British conditions would cost between 2s. and 2s. 6d. per gallon. This is an uneconomic figure based on the realisations obtainable for the products made in Germany. The application of German research work, which would enable a high proportion of the products to be utilised as high-priced chemical products, would materially improve the economic prospects of the process, but for real progress in this direction a reduction in the cost of synthesis gas is the main requirement.

NEW PLASTICS COMPANY

The directors of Thomas De La Rue & Co., Ltd., have announced that negotiations are proceeding for the formation of a new company, to be called National Plastics, Ltd., to acquire and amalgamate the undertakings of De La Rue Plastics, Ltd., and Moulded Products, Ltd. It is intended that Thomas De La Rue & Co., Ltd., shall have a substantial interest in the new company and that the members of the present board of De La Rue Plastics, Ltd., shall join the board of the new company under the chairmanship of Mr. B. C. Westall. Mr. W. J. Merifield, the chairman of Moulded Products, Ltd., will join the board of the new company as deputy chairman. Mr. H. P. Bridge, managing director of De La Rue Plastics, Ltd., and Mr. H. W. F. Ireland, managing director of Moulded Products, Ltd., have agreed to serve as joint managing directors of the new company. A further announcement will be made in due course; in the meantime De La Due Plastics, Ltd., and Moulded Products, Ltd., will continue to carry on their respective businesses as heretofore.

BRISTOL O.C.C.A.

Bristol section of the Oil and Colour Chemists' Association held its second meeting of the new session at the Royal Hotel, Bristol, on October 25, when Mr. H. R. Touchin, B.Sc., gave a paper entitled "Surface Chemistry and Paint Technology." The paper was divided into two parts, the first describing the classical experiments of Langmuir and other workers in respect of surface films, and the second the application of those theoretical methods to the resolution of many paint film problems. In a discussion which followed the monomolecular characteristics of polar materials were debated at some length.

Causes of Fires and Explosions

Lecture to London Chemists

AT a recent meeting of the London Section of the British Association of Chemists, held under the chairmanship of Mr. D. Jackson at Gas Industry House, Grosvenor Place, London, S.W.1, Mr. J. H. F. Smith, M.Sc., F.R.I.C., one of H.M. Inspectors of Factories, gave the first of a series of three lectures, his subject being: "Fire and Explosion: inflammable concentrations and ignition temperatures."

He began by exhibiting two slides showing a small works which had been completly destroyed; 18 people were killed and many more injured. This explosion was not due to war causes, but to a normally harmless material—starch. It was explained that if an explosion occurred which passed along passages and through several rooms, it was almost certainly a dust explosion, caused by the firing of a dust and air mixture. This type of explosion could be caused by starch, gums, sugar, cork dust, aluminium powder, magnesium powder, etc. Other explosions could be caused by organic vapours, petrol, benzene, etc., sprays of organic liquids; gases, such as hydrogen, carbon monoxide, etc.; and even ammonia gas could yield an explosive mixture when mixed with air.

In all cases, there are lower and upper limits of concentration for an explosive mixture to occur. The limits for vapours are accurately known; for dust they are about 0.02 to 0.04 oz. per cu. ft.; for sprays the limits are not really known. For an explosion to occur, there must be a point of ignition and the speeds of the explosive wave can be as low as 50 in./sec. or as high as 3000 metres per sec. The latter value is met with in hydrogen-air explosions and cause a shattering effect; explosions at the low rate may not be so serious if the explosive mixture is not confined.

The Wrong Approach

Whenever an explosion occurs, or its possibility is considered, there is always speculation about the source of ignition. The lecturer emphasised that this is the wrong approach; what should be considered is the prevention of an inflammable concentration.

With bulk solids fire is the most imporant; dangerous substances are phosphorous and the alkali and alkaline earth metals. Grinding of solids immediately brings about the risk of explosion. In some cases attempts are made to avoid the risk by having sufficient air dilution to cause the concentration to be below the lower explosive concentration. This method is unsatisfactory as local concentration may occur, particularly on starting or stopping a plant. An example was given of an explosion in ducts of a cotton seed plant which had almost completely destroyed a large factory. The use of inert gas is advantageous, but is usually difficult to apply. In practice, ignition should be avoided as much as possible and the employee should be protected. The worst explosions are not those which occur in the plant, but are caused by ignition of the dust in rooms, on rafters, shelves, etc. What usually happens is that a minor explosion occurs in the plant, bursting some portion of the latter. This minor explosion stirs up the dust in the workroom, and a more serious explosion follows. This again disturbs dust in corridors and other workrooms, and explosion passes right through the works. It is essential to remove all the dust by means of vacuum apparatus and care should be taken to avoid dust escaping from a plant; particular care should be taken at feeding points.

Treatment of Liquids

Liquids in containers are not always dangerous, but some may give off explosive vapours. Particles of dangerous liquids such as carbon disulphide may be stored under water, or under inert gas. One system employed consists of pipes containing liquids being enclosed inside a second pipe. The space is filled with inert gas under pressure. If the internal pipe leaks, the gas passes through and causes the liquid to empty into the container. Tanks containing inflammable liquid should be mounded to prevent the spread of the liquid if the tank leaks. The mounding should be sufficient to enable a tankful of liquid to be held. The floors of rooms should be treated in a similar manner, the mounding being carried out at door and drains. Plugs should be provided at drains so that the floors can be washed. Gauge glasses or tanks are a source of danger and self-closing valves should be employed, the valves being open only when a reading is being taken. A particularly safe method of storing liquids is to have a main tank, at or below ground level, connected to a small overhead supply tank. This latter should be fitted with a large emergency outlet valve controlled from a safe distant point.

Liquid spray is not of importance, but may occur in oil fires. The spray from a cellulose spray gun is difficult to ignite. Explosions can occur in the case of oil-fired plant if the oil is sprayed into a hot furnace from an unlighted burner. Drums frequently cause explosions after the liquid is emptied. The safest method of treating these, when they have to be repaired, is to steam them out and then test for organic

vapour. The ignition temperature of a liquid is an important property, but danger can easily arise with liquids or solids with high ignition temperatures, because decomposition during heating yields explosive mixtures. Drums have exploded during welding with oxy-acetylene torches because of this decomposition.

Gas mains can be welded when filled with gas as the concentration is above the upper explosive concentration, but the welding must be carried out in the open air in order to avoid explosive mixtures. With paint-drying machinery, explosions are avoided either by dilution of the vapour with air or by burning the organic vapours or both. The exhaust fans must be interlocked so that if the fan fails the oven ceases to work. For many purposes small supboards similar to laboratory fume cupboards are very useful and are employed for the protection of employees sealing. For some processes purging with inert gases is employed, *e.g.*, clearing gasholders previous to repair and an inert mixture is easily obtained by burning coal gas with air.

Employer's Liability In Explosions

Question of Compensation

(by Our Legal Correspondent)

THE liability of an employer to his workers who are injured in an explosion was discussed recently by the House of Lords, when considering the case of Read *v.* Lyons. The worker has, of course, the ordinary right to workmens' compensation; but the question here was whether the worker can recover common law damages, which provide much more adequate compensation.

In this case the employers were managing an ordnance factory for the Ministry of Supply. The worker was doing her work inspecting the filling of shell cases, when an explosion occurred, which injured her. There was no evidence that the employers had been in any way negligent. The worker claimed damages under a rule of law laid down 80 years ago, which has been stated as follows: "The person who, for his own purposes, brings on his lands, and collects and keeps there, anything likely to do mischief if it escapes, must keep it in at his peril; and, if he does not do so, is *prima facie*, answerable for all the damage which is the natural consequence of its escape."

This rule was applied in a case arising out of the 1914-1918 war; injury and damage were caused by an explosion at the Rainham Chemical Works and the owners had to pay damages, as the factory was being used to manufacture picric acid from dinitrophenol and nitrate of soda; the Court found that dinitrophenol and nitrate of soda are dangerous when placed in close proximity. Lord Simon and his legal bretnren refused to extend this principle to cover cases of personal injury to workers where no negligence was proved against the employer. It was pointed out by Lord Simon that this rule is applicable only where the dangerous thing escapes from the owner's land and where the owner is using his land for a non-natural purpose. In this case there was no escape; the worker was injured on the employer's premises. "Escape, for the purpose of applying the proposition . . . ." said Lord Simon, "meant escape from a place where the defendant had occupation of, or control over, land to a place which was outside his occupation or control . . . . It did not mean preventing an explosive substance from exploding, but preventing a thing which might inflict mischief from escaping . . . . In the present case there was no escape of the relevant kind at all and the worker's action failed on that ground."

Lord Simon also expressed some doubt as to the correctness of the opinions expressed in the Rainham Chemical Company's case. Lord Simon indicated that he thought the use of one's land to manufacture munitions for the purpose of helping to defeat the enemy in time of war might be a natural use of the land. It seems, however, pretty clear that Lord Simon was referring only to the manufacture of munitions in war time and that a firm manufacturing explosive substances for ordinary commercial purposes would be using its land in a non-natural way for its own purposes and would still be strictly liable to outsiders if an explosion occurred.

Agreements have been signed in Buenos Aires between the Government of Argentina and ten countries belonging to the International Fuel Emergency Council—Belgium, Canada, Denmark, France, Norway, Poland, Sweden, Switzerland, the United Kingdom, and the U.S.A.—covering the sale of 800,000 tons of Argentine vegetable oils and oilseed cakes. The products involved are 120,000 tons of linseed oil, 60,000 tons of sunflower-seed oil, 15,000 tons of peanut oil, 3000 tons of cotton-seed oil, 2000 tons of rape-seed oil, and 600,000 tons of oil-seed cakes, valued in all at 608 million pesos.

South African Chemical Notes

Sea Contamination by Mustard Gas

(From our Cape Town Correspondent)

OWING to the action of the Soviet Union in buying up all Argentina's supplies of linseed oil, and the trade ban with India, South Africa faces a serious shortage of paint in the next few months. Supplies of linseed oil, a basic ingredient of all paints, are low and the price rose by 2s. 6d. a gal. recently. Although Uruguay manufactures linseed oil, South Africa cannot obtain those supplies because that South American republic is in a United Kingdom purchasing area. Because local manufacturers are finding it increasingly difficult to obtain the necessary pigments from Britain or the United States, white and pastel shades of paint particularly are likely to be scarce in South Africa.

All stocks of poison gas in the Union have now been destroyed. With the destruction by burning in blast furnaces of the last remaining bulk stocks of mustard gas at Firgrove, in the Cape, and Klipfontein, in the Transvaal, and the dismantling of the gas equipment at these two factories, the only mustard gas now anywhere near the Union is the consignment dumped off the Port Elizabeth coast. The chemical warfare plants at Firgrove and Klipfontein, which were constructed during the war by the Union Government for the British Ministry of Supply for the manufacture of poison gas, have been dismantled. The bulk of the stocks of gas was destroyed under the supervision of Dr. W. Bleloch, who was general manager of the chemical warfare factories established by the Union Government under the general munitions agreement. The work took 14 months.

Fishing Grounds Contaminated

The destruction of the gas by burning in blast furnaces was a very hazardous operation, but it was carried out without any casualties, whereas the destruction by dumping in the sea of the canisters of mustard gas undertaken by the Quartermaster-General at the direction of the British Ministry of Supply has led to the contamination of valuable fishing grounds off the Union coast and casualties to fishermen who inadvertently caught a number of the canisters in the nets. No further poison gas will be manufactured in South Africa.

A big new abattoir planned for the Witwatersrand, as a result of recommendations made by the commission which investigated slaughter houses and cold storages throughout the Union in 1944 and 1945, is likely to engage experts from Britain to advise on the making of drugs and medicines from the various glands recovered from slaughtered stock. According to plans already approved by the Department of Agriculture, the Rand abattoir and cold storage installation will be the largest in the country. Designed for an ultimate slaughtering capacity of 120,000 cattle a year, the lay-out provides for the complete utilisation of all the products and special plant will handle offal, horns, hides, tails and even hair, converting these into useful industrial and commercial articles. Being centrally sited, the big new plant will not need to fear seasonal fluctuations in supply of cattle, as it will have a big area to draw on.

The research workers at Onderstepoort, who are making a careful study of the dangers of DDT to human beings and pets, report that, in spite of stories about the poisoning of children, the more they know about the subject the less they fear serious results. Care must be taken, however, they state, that DDT is not swallowed or sprayed on food. The safest form is the dry DDT talc-powder mixture which has been used in such great quantities in clothing and against the skin for the control of human lice and typhus fever.

Oil from a Weed

The possibility of khaki bush, at present regarded as a noxious weed, being cultivated in South Africa as a regular crop, is envisaged by a Pretoria chemist, who has just perfected a method of recovering oils from the weed. He said he had heard that some farmer made a very effective dip from khaki bush by boiling the green weed in water and using the infusion in the cattle dipping tank. Following up this clue, he found that the bush contains an oil which insect pests like ticks and fleas will avoid. By a treatment with benzine, followed by distillation, the oil can be recovered and made into a powerful insecticide. In the course of further experiments he discovered that this oil possesses remarkable frothing properties, and that it is suitable for use as a flotation agent in the recovery of gold, silver, lead, tin and vanadium from complex ores.

At the annual meeting of the National Salt Corporation it was pointed out that this was the first appearance of the salt industry in South Africa as a public company whose function it is to specialise in the salt industry and whose shares are quoted on the Johannesburg Stock Ex-

change. This appearance has been somewhat unheralded, but it, nevertheless, marks the beginning of a development that should lead to remarkable changes in the production of high grade salt in South Africa at competitive prices.

The prospectus of a new company, the National Match Co., Ltd., has been issued. Of the authorised capital of £250,000 in 1,000,000 5s. shares, 600,000 have been issued, 40,000 will be subscribed by existing shareholders at 8s. 6d., and 160,000 are being offered for public subscription at 8s. 6d. per share. The balance will be held in reserve. Apart from its interest in the manufacture of matches the company will subscribe for 406,080 ordinary shares in Masonite (Africa), Ltd., which has been formed to manufacture hardboards and insulation boards.

William Penn Oils, Ltd., has been formed to acquire and exploit in the Union the products of the Canfield Oil Co., of Cleveland, Ohio. The capital is £100,000 in 400,000 5s. shares. Of these 44,700 have been subscribed for by the promoter and original shareholders and 155,300 are to be offered to distributors of lubricating oil and other members of the public at par.

"Adsorption by Charcoal"

North-Western Engineers Meet

THE North-Western branch of the Institution of Chemical Engineers were the hosts at a joint meeting with the Liverpool sections of the Society of Chemical Industry, of the Royal Institute of Chemistry and the Chemical Society at Liverpool on October 26, when a paper, "Some Aspects of Adsorption by Charcoal," was presented by Dr. L. J. Burrage. Col. E. Briggs, vice-chairman of the North-Western branch, occupied the chair, and warmly welcomed the members of the other societies.

Dr. Burrage described the fundamental conditions for adsorption of materials by activated and by unactivated charcoals. Substances containing nitrogen, oxygen or sulphur are adsorbed by unactivated charcoals, the more chemically complex the substance, the less of it is residually adsorbed by a given weight of such a charcoal. A film consisting of a carbon-oxygen complex or compound covers the surface of the particles of a charcoal and plays an important part in adsorption phenomena. The film is displaced by any adsorbed substance.

Charcoals are made by the carbonisation of beech and birch woods, peat, sawdust, and coconut shells, and are activated by steam, air, zinc chloride, or phosphoric acid, the hydrocarbons thereby being removed from the surfaces of the particles. Macro- and micro-pores are formed in the charcoal by carbonisation and by activation respectively. Some experimental work by Dr. Burrage gave evidence that the carbon-oxygen layer on the surface of the charcoal inhibits the adsorption of the vapours of organic substances and that the carbon formed from lignins is the more active portion of the charcoal.

Australian Testing Service

Register of Laboratories

THE Commonwealth and State Governments of Australia have approved the establishment of a National Association of Testing Authorities, a voluntary association of testing laboratories aiming at providing a national testing service to meet the needs of Government, industry and commerce.

The testing facilities of many laboratories established by Government Departments and by other authorities to carry out work for their own purposes have already been made available to the public to varying extents in connection with the measurement and testing of materials, equipment, and manufactured products. The new Association aims at extending this service and ensuring a recognised standard of testing with certificates of test acceptable throughout Australia.

The Association will publish a register of laboratories and the classes of test for which laboratories have been authorised, and it is seeking to secure the recognition of laboratories thus registered, as impartial authorities whose certificates of test will be a guarantee of standard.

According to the *Industrial Australian and Mining Standard*, it is expected that the Association will come into being towards the end of this year. Initially its headquarters will be at the head office of the Council for Scientific and Industrial Research, 314 Albert Street, East Melbourne, C.2.

RADIO-ACTIVE CARBON

The heavy carbon isotope, at. wt. 13, which can be used in research on cancer and other diseases, will be produced in substantial quantities soon, according to the Sun Oil Company and the Houdry Process Corporation. The anticipated production of this heavy carbon is expected to increase from 500 to 1000 times the world supply of this chemical element, while the cost is expected to be reduced to about £10 a gram. Carbon 13 serves as a tracer in chemical reactions in living and non-living materials.

A CHEMIST'S BOOKSHELF

Encyclopædia of Chemical Reactions.

Vol. I. Compiled and edited by C. A. Jacobson. New York: Heinhold Publishing Corporation. pp. 804. $10.00.

To take an example at random, most of us are well aware that aluminium sulphate is hydrolysed by water. With a little persuasion we might even be induced to construct an equation for the reaction which would survive criticism. But if we were further pressed regarding the reaction, few of us would be able to refer to any literature concerning it, other than the standard textbooks. And what would we reply if we were examined regarding, say, the possible reactions between arsenic trichloride and triphenyl arsine, or between barium dithionate and potassium sulphate, or between elemental bismuth and potassium?

No reference work up to the present adequately describes the inorganic reactions about which one may require concise information in a hurry. Dr. Jacobson, many years ago, proposed a book or series of books which would express all such reactions in equation form, giving further information concerning the course of the reaction where necessary, and listing a few of the important literature references. The present volume is an interim stage on the road to the goal which he has set himself.

With the aid of over a hundred abstractors, more than fifteen thousand reactions have already been covered. Those in which the elements aluminium, antimony, arsenic, barium, beryllium, bismuth, and bromine, together with their compounds, are involved, have been arranged in order, and form the first volume of what will undoubtedly be a valuable reference work for inorganic chemists.

That there are numerous gaps in the information, Dr. Jacobson is the first to admit. He felt that it was desirable to proceed with publication, leaving the gaps to be filled by supplements. Each reaction detailed gives the reacting substances, usually a note regarding conditions (which may include other relevant data such as a description of the products of the reaction), an equation or equations representing the course of the reaction, and finally, the literature source from which the abstract has been made. The arrangement is alphabetical as to both reactants and reagents. A comprehensive index of reactants and reagents completes the volume.

The intention of the editor is ultimately to cover the reactions of all the active elements with the exception of carbon and oxygen. Carbon compounds, indeed, are not completely excluded; inorganic compounds such as carbonates and thiocyanates are, of course, dealt with, together with the less complex organic compounds up to hydrocarbons containing six carbon atoms. Organic reagents used essentially for inorganic processes also come under review.

On turning the pages of the Encyclopædia one finds an enormous wealth of information in a clearly presented form. Much of it is standard reference material, but the strong impression arises that a large proportion of it may offer thought for the research worker. The reactions, many and obvious, which are not covered merely lead the reviewer to hope that the editorial board will press on speedily towards the completion of the work—perhaps one should say towards the fulfilling of their mission, since it is clear that such a work can never really be completed.

Dr. Jacobson has commenced a task which should gain him the appreciative thanks of all inorganic chemists. One looks forward with pleasurable anticipation to the appearance of further volumes and, no doubt, supplementary volumes of this indispensable inorganic reference work.

Lanarkshire Scheme

Feared Migration of Coal Miners

A PROPOSAL to erect a coal distillation plant in Lanarkshire was discussed at a conference convened by the Scottish Reconstruction Committee in Glasgow recently. Mr. A. Anderson, M.P. for Motherwell, presided. Representatives of the Scottish Regional Coal Board, the Lanarkshire Trades Council, Lanarkshire M.P.'s, and other interested parties attended.

It was explained that the proposed plant, which may be erected in the Shotts district, will employ only a few hundred people, but it is pointed out that it will create work for many others in subsidiary concerns. The object of the plant is to try to prevent the migration of Lanarkshire coal workers which is anticipated as a result of the gradual working-out of the coal seams in the county, and at the same time to get the fullest value from the coal.

An aluminium yarn, consisting of an aluminium base fibre, sandwiched between two piles of specially formulated plastic film, has been developed by the Dobeckmun Co., of Cleveland, Ohio, in collaboration with the Eastman Kodak Co. and the Aluminium Co., of America. Special process and adhesives make the yarn impervious to tarnish, much lighter than ordinary metallic yarns and easy to handle. The yarn is intended for use in all forms of textiles, combined with wool, rayon, silk, cotton, etc.

Parliamentary Topics

Streptomycin

IN the House of Commons last week, Mrs. Mann asked the Minister of Health whether his attention had been drawn to the claims for streptomycin as a cure for tuberculosis; whether medical science supported the claim; and whether streptomycin was available to patients in our institutions.

Mr. Bevan: I am aware that medical research is being undertaken in the United States of America regarding the value of streptomycin in the treatment of tuberculosis. It would not be justifiable to adopt it for general use in this country until adequate clinical trials have been carried out to test such claims as are made for it, and arrangements to this end are being made.

Subsequently, Dr. Stross asked the Minister of Health how many plants were producing streptomycin; and what was the present estimated production in Britain.

Mr. Bevan replied that he understood from the Minister of Supply that at the moment two plants were producing streptomycin on a very small scale in this country, but none was yet available for clinical trials. Until those trials had been completed it would not be possible to assess the usefulness of the drug.

Linseed Oil

Mr. Belcher, replying to a question by Mr. Bossom, said he was satisfied that the allocation of linseed oil for the manufacture of paint represented a proper division between the paint and other using industries of the linseed oil supplies available to this country. He was aware that the amount available was inadequate to satisfy the demand for paint either in the home or in the export trade.

Scientific Apparatus

The Minister of Education, Miss Wilkinson, replying to questions by Mr. Gibson, said she was aware of the shortage of scientific apparatus in the schools. Steps had been taken, in conjunction with the Ministry of Supply, to ensure that when apparatus suitable for use in schools became available in sufficient quantity, the claims of the schools would receive priority.

Mr. Gibson: Is my right hon. Friend aware that this scientific apparatus is finding its way not into the schools but into retail shops first, and that the schools have to go to these shops and pay extravagant prices for it?

Miss Wilkinson: I hope my hon. Friend will give me particulars of anything of the kind because that is not my information. We have worked very closely with the Ministry of Supply in this matter. There has been difficulty, however, in getting from the schools indents and requests for the kind of apparatus they can use.

Rubber Production

Sir G. Fox asked the Secretary of State for the Colonies on what grounds it had been decided to close down rubber production in East Africa; and how the cost of production in that territory compared with the cost of production in Malaya.

Mr. Creech Jones replied that there was no ban on the production of rubber in East Africa. In view of the greater supplies of rubber becoming available from liberated areas in the Far East, it was no longer necessary to continue the wartime arrangements whereby certain rubber properties were requisitioned and worked on Government account. East African producers were now receiving 1s. 2d. per lb. from South Africa and the Board of Trade had supported that price by offering to purchase at 1s. 2d. f.o.b. all rubber which could be shipped before the end of the year. The cost of production of rubber tended to be considerably higher in East Africa than in Malaya. The recent decline in production in East Africa compared with the rapid increase in Malaya at current prices was a measure of the difference in their respective costs.

Herring Oil Extraction

Scottish Discussions

DISCUSSIONS are now proceeding between the Scottish Home Department, the Ministry of Food, Ministry of Agriculture, and the Herring Industry Board to utilise available plant at Falkirk for the extraction of herring oil during the Clyde and Forth winter herring season.

The Government has already made comprehensive plans for the processing of East Anglian surplus, and it is believed that similar plans will mature for the Scottish season.

The Herring Industry Board has been interested in the development of a herring oil industry in Scotland for some considerable time, but has been handicapped to date by limited bulk of supplies, irregularity, and uncertainty of delivery, high transport charges, and a ready market in other directions. There is every intention to develop this field in due course since herring oil is regarded as a major by-product from the industry.

Meanwhile, fish oil, of varying types, is being used in several important industries to supplement the limited stocks of linseed oil, but with only limited success. In the linoleum industry the use of fish oil has been appreciated and has assisted in maintaining production, but it is available in so limited quantities as to make it uneconomic to alter the chemical plant for the purpose.

OBITUARY

Professor Frankland

Link With Faraday

Professor Percy Faraday Frankland, who was one of the few surviving links with Faraday, died at his home in Argyllshire on October 28 at the age of 88. His research, particularly in optical activity and stereochemistry, resulted in notable contributions to the science of pure chemistry.

Born in 1858, second son of Sir Edward Frankland, F.R.S., he was educated at University College School, the Royal College of Mines, and Würzburg University. In 1880 he returned to the Royal College of Mines as demonstrator and lecturer in chemistry. Eight years later he was appointed professor of chemistry at University College, Dundee; and in 1884 he took up a similar chair at Mason College, later incorporated in Birmingham University, which he held until 1919. Since then he had lived in retirement in Scotland.

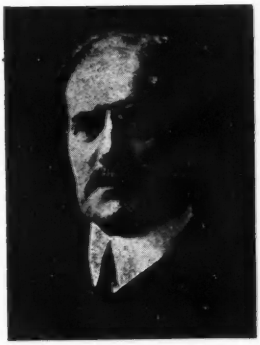
Professor Frankland, whose papers to the Royal Society and other scientific bodies numbered over 80, was chiefly concerned with optical activity and stereo-chemistry and his outstanding researches dealt with fermentation and the bacteriology of air, water, and sewage.

His early research was on the action of certain bacteria on glucose, mannitol, dulcitol, glycerine, and similar compounds. Products such as alcohol, formic, acetic, and succinic acids, carbon dioxide, and hydrogen were determined quantitatively, so far as possible, and a strict bacteriological control was maintained throughout.

Henceforth, while maintaining his interest in biological problems, Professor Frankland's main researches consisted of a study of the optical properties of salts and acyl or other derivatives of optically active acids such as glyceric, tartaric, malic, etc. His presidential address to the Chemical Society for 1912-13 contained valuable summaries of his own and other work in this and similar fields. The school that he founded continued this study, his more distinguished collaborators being Patterson, Pickard, and Price. Pickard, and later Kenyon, directed the flourishing school of stereochemistry associated for so long with Battersea laboratories.

One of the first after Pasteur to study seriously the chemical reactions which occur during the vital processes of numerous lower organisms and to apply such reactions to the preparation of pure products, Professor Frankland was awarded the Davy Medal of the Royal Society in 1919. His own work, considerable as it was, had the further merit of inspiring others to similar study. It was through him that the council of the Institute of Chemistry came to recognise the importance of encouraging chemists to take a greater interest in bacteriology and established the Examination in Biological Chemistry, for which he provided funds and apparatus.

He was president of the Chemical Section of the British Association at its Glasgow meeting in 1901, of the Institute of Chemistry in 1906, and of the Chemical Society in 1911-13. Elected to the Royal Society in 1891, he became a member of the council and was a vice-president in 1917-18. During the 1914-18 war he served on the Admiralty Inventions Board and the Anti-gas and Chemical Warfare Committees, and was chairman of the chemical section of the Royal Society War Committee.



The late Professor Frankland.

DR. JOSEPH JOHN BLACKIE, Ph.D., Ph.C., F.R.I.C., F.R.S.E., who died suddenly on October 30 at Edinburgh, was technical partner of Duncan, Flockhart & Co., wholesale manufacturing chemists.

Dr. Blackie graduated as Doctor of Philosophy of Edinburgh University in 1935. The subject of his thesis was the alkaloids of the genus senecio, and in the course of his work all the British and many foreign specimens of senecio were examined, and a number of new alkaloids isolated. He was elected a Fellow of the Royal Institute of Chemistry in 1936, and a Fellow of the Royal Society of Edinburgh in 1937.

Since 1925, Dr. Blackie had served for various periods on the Board of Examiners for Scotland of the Pharmaceutical Society, and for a number of years held the position of chairman of the board. He joined the firm of Duncan, Flockhart in 1920, becoming a partner in 1939.

Personal Notes

SIR ALEXANDER FLEMING, of penicillin fame, has become the first Freeman of his native town of Darvel.

SIR ROBERT ROBINSON, president of the Royal Society, has been asked to deliver the Faraday Lecture of the Chemical Society in 1947.

MR. S. L. TURNER, M.A., B.Sc., of A. Gallenkamp, Ltd., was returned as a Conservative candidate in the Oxford City municipal elections on November 1.

DR. F. BELL, F.R.I.C., who has been appointed Professor of Chemistry at Belfast College in succession to Dr. H. Wren, has been principal of Lancaster Technical College since 1941.

DR. F. HARTLEY, formerly secretary of the Therapeutic Research Corporation of Great Britain, Ltd., is now manager of the scientific services department of British Drug Houses, Ltd.

DR. R. F. HUNTER, D.Sc., D.I.C., A.R.C.S., formerly Nizam Professor of Chemistry at Aligarh University, has been appointed research manager to Bakelite, Ltd.

MR. A. R. DUFFIELD, MR. C. L. GUNDY, MR. W. P. SCOTT, MR. R. H. HOMMEL, and MR. R. J. WARD have been appointed additional directors of the National Drug and Chemical Co. of Canada.

DR. BRYNMOR JONES, B.Sc., Ph.D., who been appointed to the Chair of Chemistry at University College, Hull, took his B.Sc. degree with honours in chemistry and his Ph.D. degree at Bangor. He became assistant lecturer in chemistry at Sheffield University in 1931; lecturer in 1934; and senior lecturer in 1939. His researches have been mainly concerned with the kinetics of the halogenation of aromatic compounds.

Low-Grade Chromite Ores

U.S.A. Developing Home Production

ENRICHMENT of chromite concentrates by roasting and leaching has been the subject of investigations by the U.S. Bureau of Mines. The United States, the leading consumer of chromite, depends almost entirely on imports for its supply. Consumption during 1941 amounted to 714,645 tons; domestic chromite production, although the highest since 1918, was 12,731 tons or only 1.78 per cent of the domestic consumption. Home production was accelerated after 1941 by war demands, but only a small proportion of this domestic product was of sufficient quality to be substituted for the high-grade imported chromite demanded for metallurgical purposes.

The principal sources of domestic chromite are California, Oregon, Montana, and Alaska, with small and widely scattered deposits in another dozen States. Without exception, these deposits are low grade, requiring enrichment to produce a commercial product, and do not compete with imported high-grade ores in normal times. For many years the Bureau of Mines has undertaken investigations to develop methods of utilising domestic chromite ores. The problem has been approached from three angles: (1) Mechanical methods of concentration; (2) enrichment by chemical or metallurgical methods; and (3) production of metallic chromium by electrolysis of solutions prepared from ores or concentrates.

The work has shown that chromite concentrates can be roasted in a reducing atmosphere in a rotary kiln so that the iron constituents become more soluble than the chromium constituents in dilute sulphuric acid, leaving an insoluble residue with a Cr : Fe ratio of three or greater. Calcined material with a Cr : Fe ratio of three or greater was produced under the following conditions:

Rotary-kiln dimensions of 3½ ft. inside diameter, 40 ft. long; a maximum kiln hot-zone temperature of 1410° C.; a kiln rotational speed of 0.2 r.p.m.; a carbon : chromite ratio of 0.183 in the feed; coke and concentrates of same mesh; a feed rate of 475 lb. of chromite per hour; cooling in a reducing atmosphere; leaching with 18 per cent sulphuric acid for 6½ hours at 85-90° C.

Further investigations are desirable to determine the most economical and efficient kiln design, carbon : chromite ratio, and leaching method.

German Technical Reports

Latest Publications

SOME of the latest technical reports from the Intelligence Committees in Germany are detailed below. Copies are obtainable from H.M. Stationery Office at the prices stated.

BIOS 643. German anodising practice (3s.).

BIOS 664. *I.G. Farben, Leverkusen*: Salicylic acid, sodium salicylate, synthetic phenol (1s.).

BIOS 669. *Interview with Dr. Roelig, formerly of I.G. Farben, Leverkusen Laboratories*: Hysteresis machine for rubber testing (6d.).

BIOS 686. *I.G. Farben, Zweckel*: Ethylene oxide by direct oxidation of ethylene (6d.).

BIOS 689. *Interrogation of Dr. Casper, Dr. Eisenmann, Mr. Mersh, Dr. Stocklin*: Plastics and rubber (1s.).

BIOS 693. Investigation of the light alloy forging industry in Germany (5s.).

General News

Plastic sheeting is to be sold at fixed maximum prices as from January 15.

The Control of Iron and Steel (No. 54) Order, (S.R. & O. No. 1728, 1946), which came into force on October 30, reduced the price of alloy steels containing molybdenum and vanadium.

The strike of 500 workers at Shawfield Chemical Works, Rutherglen, has been settled, and work has been resumed. The men have been on strike for more than four weeks.

More than 100 tons of coal a day will be required by the new Dunlop factory at Speke for processes and heating when full production is reached (*see* THE CHEMICAL AGE, September 21, p. 347).

D.T.D. Specification 678, "Aluminium Alloy-Coated Aluminium Alloy Sheets and Coils" has been issued by the Ministry of Supply. Copies are obtainable from H.M. Stationery Office (1s.).

The Board of Trade announces that up to September 30 2,236 building projects for new factories and extensions to existing factories had been approved. These should eventually provide additional employment for about 190,000 men and 150,000 women.

When a 100-gallon container of battery acid slipped off a lorry on the main road over Shap Fells, last week-end, the acid poured into Borrowdale Beck spawning grounds, killing thousands of salmon, sea trout, trout and eels.

The rubber market will be free to resume normal activities from November 18, Mr. Marquand, Secretary, Overseas Trade, told the House of Commons on Monday. This will permit private trading in rubber and the re-establishment of the London rubber market.

A £15,000,000 scheme for the electrification of line and introduction of Diesel-electric engines is announced by the Southern Railway. The proposal is to electrify a further 284 route miles, eliminating all steam locomotives from the S.R. east of Portsmouth, and to build 200 Diesel-electric engines of 400 to 600 h.p. and 150 powerful electric engines, in addition to multiple unit stock.

Phosphatic and potassic fertilisers, it is understood, will be obtainable by farmers and agriculturists in sufficient quantities to reach the official 1946-47 target, but nitrogenous fertiliser supplies may fall short by as much as 15 per cent. This is the result of international allocation. No potash is now being exported from the British zone of Germany, and Britain must rely on other sources.

From Week to Week

Another new industry will be developed on Merseyside as a result of the decision of the Shell Petroleum Co., Ltd., to start production of synthetic soap at the Stanlow Oil Refineries, Ellesmere Port.

The Ministry of Labour and National Service has issued returns showing that in August 425,000 people were employed in metal and chemical industries on manufacture and supplies for the Forces, as compared with 1,070,000 in mid-1939.

Great Britain is exporting 6,000,000 gallons of creosote during the latter half of this year, which will help United States wood preservers, who were otherwise faced with a 20,000,000 gallons shortage owing to coal and steel strikes. Many plants have already had to close down.

The Minister of Food announces that the only change in the existing prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending November 30, is in regard to sperm oil, all types of which have been increased in price by £14 per ton naked ex store.

Foreign News

A plant for making the intermediates for nylon is being constructed in Texas, U.S.A.

Coal stocks being exhausted, all but one of Berlin's power stations are ceasing operations this week.

Czechoslovakia's leading imports in August included chemical auxiliary materials and chemical products valued at Kcs. 74,743,000.

Exports of nitrate of soda from Chile in the first six months of 1946 totalled 809,250 metric tons, compared with 879,730 tons in the first half last year.

Four factories, one an artificial textile works, have been destroyed by fire in Saxony, in the Soviet zone. German sabotage groups are blamed.

It is reported from Germany that the Berlin police have seized 77,000 phials of cyanide of potassium which were to be disposed of in the black market by drug traffickers.

A rich oilfield, covering 75,000,000 acres, is reported to have been discovered on the slopes of the Andes in Peru. The Peruvian Government proposes spending $30,000,000 in sinking wells.

Shortage of lead and lead chemicals, both imported and domestic, has lead to the U.S. Government issuing a Limitation and Restriction Order for these products, including insecticide productions.

A Dutch whaling factory ship, the first to leave Holland since 1874, is on its way to Cape Town and then to the Antarctic for the opening of the whaling season on December 8.

Austria's magnesite output is increasing steadily. In September, Styria exported 135 tons to Italy, 195 tons to France and 90 tons to Switzerland, while 17 tons were used for home consumption.

As a contribution to the scheme for ensuring a winter supply of coal for German homes in the British and American zones, miners in the Aachen and Cologne districts have undertaken to work on Sundays.

A five years' plan of synthetic oil production, with a yearly output of some 100,000 tons, is reported to have been started by Russia. The oil refineries will be established in Esthonia and in the Southern Sowjetunion.

Nationalisation of I. G. Farben—reported to have been recommended by Social Democrats—is now stated to have been approved by the Drafting Committee of the State Parliament of Great Hesse, in the U.S. zone of Germany.

Swiss chemical exports have, according to official statistics, declined from 40.5 million francs in August to 34.7 million francs in September. Exports of industrial chemicals, on the other hand, rose by 1.1 million francs to 6.9 million francs.

An agreement on trade between Sweden and the British and American zones of Germany has been reached. The two zones, it is understood, need mainly, among other goods, chemicals, especially arsenic, while Sweden's wants include salt, chlorine and diesel engines.

Antimony ore and metal have been brought back under import control in the United States, in order to restrict the importation of ore concenrates or low-grade metal intended for refinement in bond and the re-export of the resultant products to procure enough antimony for needs of U.S.A.

The Siamese Government authorities have informed the Government of the Malayan Union that they are prepared to return British and Australasian tin mines in Siam to their owners. The concerns affected are asked to communicate with the Control of Alien Businesses at Bangkok.

The Carbon Black Company bought the Nash carbon black plant froum the U.S. War Assets Administration for $550,000. The plant, which can produce 15,000,000 lb. annually, is one of six plants built by the U.S. Government to meet the war-time shortage of carbon black for military rubber products.

The Chilean Government has applied to the Export-Import Bank of Washington for a credit of U.S. $20,000,000 to assist the development of oil production and of the copper cement industries.

The pyrethrum industry in Ecuador, started experimentally in 1940, was not seriously developed until 1945, during which year it is understood that 1500 lb. of flowers were shipped to the U.S.A. The 1946 is expected to total 5000 lb., most of which is again likely to be earmarked for the United States.

The 1946 Iron and Steel Exposition was held in Cleveland, Ohio, in connection with the 42nd annual convention of the Association of Iron and Steel Engineers. Manufacturers of steel plant and mill equipment demonstrated new methods and new products and leading technical men in the industry were heard in addresses.

Bolivian exports of tin for the first quarter of 1946 were 9498 long tons, against 9226 in the first quarter of 1945, says *Foreign Commerce Weekly*. Wolfram exports were also lower, but fine copper rose from 1364 to 1659 short tons, and antimony exports amounted to 1746, against 1482 in January-March, 1945.

Russia's requirements of German technicians are now satisfied, according to a statement by Herr Brack, president of the Central Committee for Social Welfare in the Soviet zone. The United States, it is announced, plans to transfer further volunteer Austrian and German scientific and technical specialists to join the 200 already sent to the U.S. since the war ended.

For the first eight months of 1946, Ceylon imported iron and steel to the value of Rs.10,033,493; non-ferrous metals, Rs.2,168,966; chemicals, drugs, dyes and colours, Rs.8,565,184; oils, fats, and resins, Rs.7,604,440; and coal, Rs.13,634,260. During the same period she exported rubber to the value of Rs.145,867,041, and seeds and nuts Rs.35,964,490.

Gammexane is to be produced in Argentina, following an arrangement just completed between Industria Quimica Argentina "Duperial" S.A. and I.C.I. The British company is stated to have put full technical information at the disposal of the concern, which will produce the insecticide at its plant at Sarandi.

Recovery of chemical products from salvaged German ammunition is being successfully continued in the American occupation zone of Germany; smokeless powder is, for instance, being used in manufacturing paint, while fatty acids for soap making are being recovered from metal salt contained in firebomb gelatine, from which gasoline is also being salvaged.

Sweden's pig-iron production amounted to 53,500 tons in August, while the following figures indicate the country's steel production: Bessemer ingots 1300 tons, Thomas ingots 7300 tons, Martin steel 54,700 (both ordinary and high-grade) and 36,100 tons of electric steel. Domestic consumption of iron and steel totalled 98,800 tons.

All Japanese iron and steel production has been concentrated, since July, at the Yawata plant in Fukuoka Prefecture, to eliminate the wasteful consumption of coal in a great number of uneconomically operating plants. This arrangement is to continue until the coal situation improves. The only exceptions are some electric furnaces melting scrap iron.

Recent investigations by the Bureau of Mines in the processing of representative bauxite samples from Saline and Pulaski Counties, Ark., have demonstrated that commercially acceptable concentrates can be obtained from these low-grade materials and a 50-ton demonstration plant has been constructed to continue the investigation on a semi-commercial scale.

An announcement made by the South African Ministry of Commerce and Industries states that the government has decided in the national interest to assume control over the possible establishment of an industry for the manufacture of liquid fuel from coal in South Africa. Legislation is to be introduced during the next session of Parliament to make such manufacture subject to licence.

The tenth edition (1946) of the Classified Directory of the Association of Consulting Chemists and Chemical Engineers, Inc., 50 East, 41st Street, New York, has just been published, and is obtainable on application without charge. The "scope list" contains some distinguished names, well known in this country, such as Marston T. Bogert, J. V. N. Dorr, Wallace P. Cohoe, and G. Ullmann.

New dyestuffs announced in the latest number (No. 52) of the Ciba Review (Ciba, Ltd., Basle, Switzerland) are Coprantine Brown GRLL, for cotton, staple fibre, and rayon; and Coprantine Red BLL, a new bluish red possessing good fastness to light, water and perspiration. Both colours can be used in combination with other Coprantines and are suitable for application on all types of machine.

The U.S. Department of Agriculture announce that estimated world requirements of nitrogen fertilisers exceed supplies by nearly one million tons, or approximately 25 per cent. In the case of phosphate rock and soluble phosphates, demand exceeds supply by 16 per cent. and 32 per cent. respectively. U.S. production of fertilisers is expected to be maintained at the peak war level.

The General Electric Company have taken over from the Du Pont Company government contracts in connection with the atomic energy programme. Their chemical department will operate the government-owned Hanford Engineering Works at Richland, Washington.

Four Government - owned synthetic ammonia plants in the United States are to be restored to operation in order to augment supplies of nitrogen for fertiliser production in the coming year. They are the Cactus Ordnance Works in North-West Texas and those at Morgantown, Ohio River and Missouri.

A solvent extraction system which can increase the annual oil yield from cotton seed, linseed, castor and most oil-bearing seeds, nuts and beans has been developed by the research staff of a Cleveland oil mill. The process is said to extract 98½ per cent. of the available oil from vegetable matter used in the production of soaps, salad oils, cooking oils, linoleum, paints and other products.

A method of prospecting for petroleum and natural gas by bacteriological analysis of subsurface soils has been invented by a Russian geologist. The method was worked out before the war, but further research could not take place until 1945, when an expedition prospected on the basis of this method in the Stavropol region in the North Caucasus and discovered a gas deposit of industrial importance near the village of Mikhailovsky.

In Belgium, a new aluminium rolling mill is being erected in the neighbourhood of Antwerp by the Société Industrielle de l'Aluminium (Sidal), a company with a fully paid-up capital of 52,000,000 francs subscribed, in equal parts, by a French aluminium group and by Belgian financial interests. The manufacturing programme includes a wide range of products such as plates, strips, and tubes.

A list of 513 firms in Poland which are to be nationalised without compensation, and another list of 404 firms for which the Polish Government is prepared to compensate the owners are published in the Board of Trade Journal. British nationals who have interests in any of the firms are urged to communicate with the Trading with Enemy Department, 24 Kingsway, London, W.C.2.

The Dixie Ordnance Works in Louisiana, U.S.A., where during the war anhydrous ammonia was produced from natural gas, has been acquired by Commercial Solvents Corporation, who will resume production as early as possible. Ammonia from the plant is expected to be available for sale by the end of the year; and it will also be a source of raw materials for the manufacture of nitroparaffins and other chemicals.

Egypt will import 300,000 of Chilean nitrate of soda per annum over the next three years, after which the amount may be raised to 800,000 tons per annum for five years. Strikes, however, continue to affect the output of nitrate in Chile.

The U.S. Government and Bolivian mine-owners have signed an agreement for the purchase by the U.S. of tin at a rate of 62½ cents per lb., one cent less than the previous contract which expired on June 30. Under this agreement the U.S. will receive up to 18,000 tons of tin this year, compared with 26,000 tons last year.

Forthcoming Events

November 11. Society of Instrument Technology. College of Technology, Manchester, 7.15 p.m. Mr. A. Jacob: "Handling material in bulk by weight."

November 12. Institution of the Rubber Industry (Midland Section). Goodyear Tyre and Rubber Co., Ltd., Wolverhampton, 7.15 p.m. Mr. F. Siddall: "Rubber machinery developments."

November 12. Institution of the Rubber Industry (Scottish Section). Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, 7 p.m. Mr. G. C. Tullock: "Training within industry."

November 13. The Chemical Society. The University, Liverpool, 5 p.m. Dr. H. W. Thompson: "Some Applications of Infra-red Measurements."

November 13. Institute of Welding (North London Branch). Technical College, Barking Road, East Ham, E.6, 7.30 p.m. Mr. F. Clark: "Repairing and Reclamation."

November 13. Institution of the Rubber Industry (West of England Section). George Hotel, Trowbridge, 7.45 p.m. Mr. W. P. Elliott: "Cost Accounting as a Service to Factory Management."

November 13. Oil and Colour Chemists' Association (London Section). Royal Society of Tropical Medicine and Hygiene, 26, Portland Place, London, W.1, 6.30 p.m. Mr. N. A. Bennett, Mr. R. M. W. W. Wilson, Dr. F. Wormwell: "Anti-corrosive pigments."

November 13 and 14. Iron and Steel Institute. Institution of Civil Engineers, Great George Street, London, S.W.1. Autumn meeting. Morning sessions, 9.30 a.m.-12.30 p.m.; afternoon sessions, 2.30 p.m.-5.30 p.m.

November 14. Royal Institute of Chemistry (Birmingham and Midlands Branch). The University, Birmingham, 7 p.m. Mr. F. Challenger: "Recent Investigations in the Organic and Biological Chemistry of Sulphur."

November 15. The Chemical Society. The University, Glasgow, 7.15 p.m. Professor A. R. Ubbelohde: "Melting and Other Phase Changes."

November 15. Society of Instrument Technology (Scottish Section). Royal Technical College, Glasgow, 7 p.m. Mr. S. H. Hawkins: "Temperature Measurement."

November 15. Royal Institute of Chemistry. Geological Society's Rooms, Burlington House, Piccadilly, London, S.W.1, 6 p.m. Dr. J. C. Withers: "The Chemist as Information Officer" (Streatfeild Memorial Lecture).

November 15. Society of Dyers and Colourists (jointly with R.I.C., Chemical Society, S.C.I. and Textile Institute). College of Technology, Manchester, 6.30 p.m. Professor E. L. Hirst and Dr. J. K. N. Jones: "The Chemistry of Plant Gums and Related Substances."

November 18. Society of Chemical Industry (London Section, jointly with Food Group). Royal Institution, Albemarle Street, London, W.1, 6.30 p.m. Mr. F. P. Dunn: "British Chemical Publications" (Jubilee Memorial Lecture).

November 19. Hull Chemical and Engineering Society. Church Institute, Albion Street, Hull, 7.30 p.m. Dr. L. Mullins: "X-rays in Industry."

November 20. Society of Dyers and Colourists (Midlands Section). Midland Hotel, Derby, 7 p.m. Mr. C. C. Wilcock: "Preparing, Dyeing and Finishing of the New Fibres."

November 20. The Chemical Society (jointly with Dublin Section of R.I.C.). University College, Upper Merrion Street, Dublin, 7.30 p.m. Dr. T. G. Brady: "Biochemical Microtechnique."

November 20. Institution of the Rubber Industry (Leicester Section). College of Art and Technology, Leicester, 7.30 p.m. Mr. F. S. Roberts: "Rubber Compounding Ingredients."

Company News

British Celanese, Ltd., report consolidated net profit of £1,781,144 for the year ended June 29 last. The ordinary dividend remains at 8 per cent.

The nominal capital of **Glovers (Chemicals) Ltd.,** Wortley Low Mills, Lower Wortley, has been increased beyond the registered capital of £7000 by £23,000 in £1 shares.

Anglo-Iranian Oil Co., Ltd., is paying an interim ordinary dividend of 5 per cent, which is the same as for the previous four years.

An increased interim dividend—10 per cent as compared with 7½ per cent—is being paid

by **United Molasses Co., Ltd.** This is the first change since 1938.

Trading profit of **Erinoid, Ltd.,** for the year ended July 31 was £133,020, compared with £59,755 for the previous year, and net profit was £22,257 (£17,611). The ordinary dividend is unchanged at 10 per cent.

A trading loss of £14,378 is reported by **Triplex Safety Glass Co., Ltd.,** for the year ended June 30. Last year there was a profit of £117,355. The net loss is given as £26,847. The dividend of 7½ per cent is half that paid last year.

Trading profit earned by **Thomas W. Ward, Ltd.,** for the year ended June 30 totalled £399,501. To the final ordinary dividend of 6¼ per cent is added a victory bonus of 2½ per cent, making 12½ per cent for the year, compared with 10 per cent and no bonus last year.

Lever Brothers and Unilever, Ltd., are paying an unchanged ordinary dividend of 5 per cent for 1945. Consolidated net profit, excluding the proportion attributable to outside shareholders' interests in subsidiary companies, is given as £8,639,008, which compares with £8,562,171 for 1944, and the company's net profit before appropriations £7,118,672 (£6,682,216).

Lever Brothers & Unilever N.V., will pay a corresponding dividend, calculated in accordance with the equalisation agreement and converted at the rate of exchange of Fl.10.691 to £1 sterling, of 4.45 per cent (actual Fl.44.50 per share of Fl.1000) less 15 per cent dividend tax payable on presentation of the appropriate dividend coupon. Consolidated net profit, excluding the proportion attributable to outside shareholders' interests in subsidiary companies, was Fl. 18,079,358. The net profit before appropriations was Fl.15,453,551. No comparative figures are given for N.V. for 1944 as they included a large amount of profit attributable to 1940-43. The figures for the year 1945 include several exceptional items.

New Companies Registered

Speedoil (Great Britain) Ltd. (422,269).—Private company. Capital £500 in £1 shares. Chemists, druggists, oil refiners, etc. Subscribers: H. Gordon; A. J. Russell. Registered office: 20, Chandos Avenue, Whetstone, N.20.

Deleopold Products Ltd. (422,443).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, etc. Directors: L. de Leopold; A. W. Metcalfe. Registered office: 34, Sherrards Park Road, Welwyn Garden City.

Rigby Chemicals, Ltd. (422,357).—Private company. Capital £1000 in £1 shares. Manufacturers, importers and exporters of and dealers in chemicals, gases, etc. Subscribers: P. M. Cordell; V. E. Winter. Secretary: V. Winter, 89, Kingsway, London, W.C.2.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH GENERAL MANUFACTURING CO. (1941) LTD., London, W.C., chemical, etc., manufacturers. (M., 9/11/46.) October 8, mortgage, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 40, Glasshill Street, Southwark, with machinery, fixtures, etc. *Nil. December 14, 1945.

UNITED KINGDOM GAS CORPORATION, LTD., London, E.C. (M., 9/11/46.) October 12, Trust Deed dated October 1, 1946, securing £2,200,000 with a premium of £2 per cent payable on redemption (inclusive of £1,200,000 like stock secured by Trust Deeds dated November 14, 1935, etc.), present issue £1,000,000; general charge. *£1,800,000. July 16, 1946.

Satisfaction

F. COLLINS, LTD., Manchester, chemical and general merchants. (M.S., 9/11/45.) Satisfaction October 14, £1000, registered October 2, 1942.

Chemical and Allied Stocks and Shares

LED by a further general advance in British Funds, investment buying has continued to dominate stock markets, with the main emphasis on securities offering higher yields than gilt-edged. Home railway prior charges were again prominent, also bank and insurance shares, while the scarcity of industrial debentures and preference shares, which are held very firmly, was partly responsible for the increased demand again in evidence for leading ordinary or equity shares. The latter were also helped by the good impression created by recent dividend announcements.

Shares of chemical and kindred companies participated in the upward market trend and were also helped by news of expanding chemical exports. Imperial Chemical at 44s. again moved higher, B. Laporte rose

further to 95s. 7½d. Fisons were 57s. 3d., and British Drug Houses 59s. Greeff-Chemicals Holdings 5s. shares changed hands at 12s. 6d. Turner & Newall (87s. 3d.) continued to be helped by higher dividend hopes, while United Molasses were good at 55s. 9d. xd on the unexpected increase in the interim dividend. Borax Consolidated deferred (47s. 9d.) remained under the influence of current dividend estimates. Talk of a higher interim payment next month was partly responsible for an advance to 138s. in the units of the Distillers Co. De La Rue at 133 responded to the latest developments in connection with the plastics interests of the group, and were also favoured in view of the forthcoming interim dividend and the splitting of the £1 shares into four of 5s. each. British Oxygen 98s. 9d., Associated Cement 69s. 4½d., and British Plaster Board 33s. 3d. also reflected the upward market trend. British Aluminium 43s. 9d., and Birmid Industries 97s. continued to be helped by indications of increasing uses of aluminium and aluminium alloys.

Powell Duffryn at 26s. 1½d. moved higher on the good impression created by the consolidated accounts, but colliery shares generally encountered a little profit-taking following their recent good gains. Stavely were 57s., Shipley 42s. 6d., and Bolsover 67s. 3d. Steels recorded moderate gains, with Dorman Long 26s. 7½d., Guest Keen 43s. 9d., and Stewarts & Lloyds 52s. 4½d. Babcock & Wilcox, which remained under the influence of the higher dividend, rose further to 67s., and Hopkinsons responded to higher dividend possibilities. Textiles moved moderately higher; Lancashire Cotton Corporation were good at 40s. 6d. on current dividend estimates. Courtaulds moved up to 53s. 9d., and British Celanese were 35s. 3d. following publication of the full results. Lever & Unilever reflected disappointment with the unchanged 5 per cent dividend and at one time fell back to 45s., but later recovered to 49s. 6d. a decline of only 6d. on balance for the week. The market is continuing to assume that in due course the Lever group will feel disposed to follow a less conservative dividend policy and that the 10 per cent payments of pre-war years are likely to be regained.

Boots Drug were firm at 60s. 6d., Aspro shares rose to 41s. 9d., Beechams deferred were 27s. 3d., Sangers moved up to 34s. 3d., and Timothy Whites to 45s. 9d. British Glues & Chemicals 4s. ordinary have been favoured at the higher level of 16s. 4½d. Triplex Glass rallied to 38s. on the good financial position shown by the accounts and the directors' reference to overwhelming demand for the company's products. The greater part of the difficulties which resulted in the slump in earnings and halving of the dividend for the past year is attributed not to safety glass, but to endeavours to build up an ancillary business in manipulation and sale of articles made of "Perspex"; energetic steps have been taken to rectify the troubles encountered. Oil shares failed to hold earlier gains.

British Chemical Prices

Market Reports

REPORTS from nearly all sections of the London general chemical market indicate a steady demand with available supplies inadequate to meet immediate requirements. Delivery specifications under existing contracts cover good quantities and new bookings for future delivery continue on a fair scale. The market is without feature, with a routine trade passing in the soda products and potash products. A steady flow of inquiry for pitch has been maintained in the coal tar products market. Elsewhere, conditions continue firm, with production proceeding along satisfactory lines.

MANCHESTER.—Alkali products generally are meeting with a good demand on the Manchester chemical market and home users' inquiries for these have been circulating freely during the past week. Shippers are also interested in these as well as in a fairly wide range of other products. Delivery specifications for domestic users of the ammonia and magnesia products cover good quantities, and there is likewise a steady demand for the potash chemicals as they become available and for the mineral and other acids. Firm price conditions continue throughout the market. So far as new bookings are concerned, moderate activity has been reported locally in the tar products section, but existing orders in most sections are being steadily drawn against.

GLASGOW.—The usual amount of business was transacted in the Scottish chemical market during the past week. There has been no slacking off in demand for all classes of industrial chemicals and raw materials, and the difficulty continues to be the inability of suppliers to make delivery against such heavy demands. Prices show an increasing tendency to rise. In the export market the supply position is deteriorating and an increasing number of raw materials are becoming in exceedingly short supply, rendering as a consequence the export of certain manufactured chemicals nearly impossible. The past week, however, has seen a considerable volume of business transacted in such chemicals as precipitated chalk, zinc oxide off-colour grades, plasticisers, sulphur, aluminium sulphate, zinc chloride, fluorspar, and sulphuric acid. Delivery of such chemicals, however, takes increasingly longer and shipping space is difficult to arrange. Prices in this market also show no tendency to decrease.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Applications for Patents

Molten salt baths.—Ajax Electric Co., Inc. 29251.

Metal deposition.—P. Alexander. 29280.

Liquid separating apparatus.—W. Alexander. 29622.

Stainless steel.—Alloy Research Corporation. 29333-4.

Aryloxymonocarboxylic acids.—American Chemical Paint Co. 29252.

Separating materials.—American Zinc, Lead, & Smelting Co., and C. E. Wuensch. 29264.

Hydrocarbons.—C. Arnold. (Standard Oil Development Co.) 29417.

Polymers.—J. C. Arnold. (Standard Oil Development Co.) 29416.

Resinous condensation products.—D. Atherton, W. Charlton, and I.C.I., Ltd. 29367.

Heat exchangers.—Babcock & Wilcox, Ltd. 29626.

Temperature regulation of vapours.—Babcock & Wilcox, Ltd., and C. H. Sparks. 29364.

Temperature regulating.—Bailey Meters & Controls, Ltd., and C. W. Payn. 29625.

Polystyrene resins.—British Resin Products, Ltd., E. M. Evans, and J. F. Williams. 29755.

High temperature alloys.—British Thomson-Houston Co., Ltd. 29335.

Storage of liquefied gas, etc.—N. D. Chopra. 29229.

Treatment of cast iron.—Chromium Mining & Smelting Corporation, Ltd. 29906.

Separation of pulverulent materials.—Cie. de Produits Chimiques et Electrométallurgiques Alais, Froges & Camargue. 29867.

Preparation of magnesium.—Cie. de Produits Chimiques et Electrométallurgiques Alais, Froges & Camargue. 29868.

Treatment of toluene.—Directie van der Staatsmijnen. 29702.

Washing gases.—Directie van der Staatsmijnen. 29703.

Vinylpyridines.—E.I. Du Pont de Nemours & Co., and L. F. Salisbury. 29372.

Metal treatment.—Electro Metallurgical Co. 29777-8.

Measurement by flow of gas.—Etavex S.A. 29470.

Coating compositions.—J. O. Farrer. (Continental Can Co., Inc.) 29697.

Treatment of vegetable fibres.—Fibres Astracarium Nacional S.A. (Fanasa.) 29270.

Textile impregnation.—J. E. Fielden. 29199.

Gas and air cleaners.—T. Gavagnin. 29832.

Acrylic acids.—General Aniline & Film Corporation. 29403-4-5-6-7-8-9.

Polyvinylisocyanate.—General Aniline & Film Corporation. 29410-11.

Pulverluent iron.—General Aniline & Film Corporation. 29564.

Gelatin solutions.—General Aniline & Film Corporation. 29903.

Fluid control valves.—L. M. Glen. 29220.

Cleaning tanks.—J. D. Handley. 29450.

Mixing liquid substances.—V. H. J. Harvey. 29226.

Treatment of borax.—F. J. Hendel. 29256.

Lactic acid products.—Howards & Sons, Ltd., L. H. Adcock, G. C. H. Clark, and R. H. Lock. 29232.

Emulsifying agents.—L. M. Jencsa, and J. Polasek. 29246-8.

Bituminous compositions.—E. Kay, and I.C.I., Ltd. 29369.

Antiseptic preparations.—T. D. Kelly. 29496.

Fluid flow measuring.—H. Kronberger. 29282.

Progesterone preparation.—Laboratoires Français de Chimiotherapie. 29740.

Treatment of hides, etc.—Lever Bros., & Unilever, Ltd., and F. H. Moult. 29231.

Proteins.—Manufacturers Research Laboratories, Inc. 29936.

Organic compounds.—Mathieson Alkali Works. 29905.

Alcohols.—Mo och Domsjö A/B. 29709.

Soap.—Oreal-Maroe. 29630.

Liquid products.—Oreal-Maroe. 29631

Emulsifying liquids.—L. M. Parr, and R. J. Jay. 29713.

Pyrimidines.—Pyridium Corporation. 29934.

Catalysts.—P. W. Reynolds, J. W. Donaldson, and I.C.I., Ltd. 29370-1.

Condensation products.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.) 29461.

Treatment of glass fibres.—W. R. Schler. 29279.

Water-repellent compositions.—Soc. des Usines Chimiques Rhône-Poulenc. 29699.

Complete Specifications Open to Public Inspection

Production of hot gases under pressure.—Brown, Boveri & Cie A.G. April 5, 1945. 115/46.

Cyanidation of copper-bearing gold ores.—American Cyanamid Co. April 7, 1945 35098/45.

Plasticised elastomer compositions.—American Cyanamid Co. April 4, 1945. 7656/46.

Fluid flow control devices.—Dole Valve Co. April 6, 1945. 10000/46.

Vacuum distillation process and apparatus.—Distillation Products, Inc. April 5, 1945. 8724/46.

Organic amino compounds.—E.I. Du Pont de Nemours & Co. April 3, 1945. 10287/46.

Manufacture of fibre-forming synthetic linear polyamides. April 3, 1945. 10288/46.

Automatic operation of ovens for electrolysing in the melt.—L. Ferrand. June 30, 1942. 25924/46.

Plasticised vinyl resin compositions.—B. F. Goodrich Co. April 5, 1945. 7553/46.

Pesticides.—B. F. Goodrich Co. April 2, 1945. 8550/46.

Manufacture of substituted furoimidazoles.—K. Hoffmann. April 4, 1945. 9152/46.

Salt bath furnaces.—A. de F. Holden. April 5, 1945. 28869/45.

Polymerisation of methacrylic acid esters.—I.C.I., Ltd. Sept. 18, 1941. 13191/42.

Polymerisation of vinyl esters of organic acids.—I.C.I., Ltd. Sept. 18, 1941. 13192/42.

Processes for the chemical conversion of organic substances.—Laboratoire de Recherches Industrielles (Michot-Dupont.) March 20, 1942. 25881/46.

Distilling process and apparatus.—J. L. et. Lavigne. April 4, 1945. 10437/46.

Preparation of alkyl esters of α(2-4-carboxy)-thiazolidinyl phenaceturic acid and derivatives thereof.—Lederle Laboratories, Inc. April 4, 1945. 7115/46.

Distillation apparatus.—A. D. Little, Inc. April 3, 45. 24902/46.

Treating a gas with liquid.—Pease Anthony Equipment Co. April 6, 1945. 10006/46.

Manufacturing hollow glass objects.—Pyrex S.A. May 11, 1943. 25888/46.

Process for treating cellulosic raw material in order to obtain products and by-products.—J. C. Séailles. Feb. 4, 1941. 25874/46.

Manufacturing and extracting calcium aluminates.—J. C. Séailles. April 23, 1945. 25876/46.

Process for making phosphorous products and soluble calcium aluminates out of phosphorous ores.—J. C. Séailles. March 6, 1941. 25878/46.

Manufactures of calcium aluminates.—J. C. Séailles. March 24, 1944. 26046/46.

Process for treating cellulosic raw materials.—J. C. Séailles, and Soc. des Ciments Français. Dec. 11, 1942. 26052/46.

Catalytic processes and catalyst preparation.—Shell Development Co. April 2, 1945. 2764/46.

Shaping solid objects of glass and like materials.—S.A. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey. March 27, 1945. 25884/46.

Dissolution of aluminates of lime with a view to production of pure alumina.—Soc. des Ciments Français. May 6, 1942. 25879/46.

Extraction of alumina from raw calcium aluminates.—Soc. des Ciments Français. May 6, 1942. 26053/46.

Double-action distillation.—Soc. des Etablissements Barbet. May 17, 1943. 25862/46.

Double-action distillation.—Soc. des Etablissements Barbet. Oct. 6, 1944. 26020/46.

Manufacturing solid solutions of metallic carbides and corresponding compositions.—Soc. le Carbone-Lorraine. July 16, 1941. 25926/46.

Producing carbides of tungsten or of molybdenum and their sintered alloys.—Soc. le Carbone-Lorraine. Aug. 4, 1941. 25927/46.

Antibiotics.—E. R. Squibb & Sons. Apr. 5, 1945. 10144/46.

Process for treating acid sludge.—Stauffer Chemical Co. April 3, 1945. 24002/45.

Disazo dye.—Technicolor Motion Picture Corporation. April 7, 1945. 31836/45.

Complete Specifications Accepted

Oil or like filter elements.—AC-Sphinx Sparking Plug Co., Ltd., and D. B. Browne. Sept. 22, 1944. 581,105.

Monalkamine esters substituted pyrrole-3-carboxylic acids.—American Cyanamid Co. July 31, 1943. 581,152.

Process for the preparation of alkylation derivatives of dihydroxydibenzanthrone.—E. G. Beckett, and I.C.I., Ltd. Aug. 15, 1944. 581,259.

Production of organic esters of celluiose.—British Celanese, Ltd. March 9, 1944. 581,157.

Curing of polymeric materials.—J. M. Bust, D. A. Harper, W. F. Smith, G. N. Welding, and I.C.I., Ltd. Dec. 21, 1942. 581,143.

Regeneration of vulcanised natural and synthetic rubbers.—R. B. F. E. Clarke, and I.C.I., Ltd. June 24, 1942. 581,136.

Curing of polymeric materials.—D. H. Coffey, W. F. Smith, H. G. White, and I.C.I., Ltd. June 25, 1943. 581,146.

Heat exchange devices.—J. L. Coltman, and I.C.I., Ltd. March 31, 1944. 581,188.

Gas measuring apparatus.—Compañia para la Fabricacion de Contadores y Material Industrial S.A., and P. Viteau. July 10, 1944. 581,248.

Preparation of unsaturated oxalates and polymers thereof.—J. W. C. Crawford, F. J. H. Mackereth, and I.C.I., Ltd. July 26, 1944. 581,251.

Water-soluble resinous condensation products.—Distillers Co., Ltd., J. D. Morgan, and B. Frenkel. Jan. 21, 1942. (Cognate applications 905/42 and 1073/43.) 581,127.

Production of amino-hydrazines.—J. G. N. Drewitt, and D. P. Young. June 28, 1944. 581,153.

Plasticisation of synthetic rubber-like materials.—Dunlop Rubber Co., Ltd., and

P. H. Amphlett. Nov. 17, 1942. 581,141.

Production of hydrocyanic acid and catalysts therefor.—E.I. Du Pont de Nemours & Co. Sept. 20, 1943. 581,271.

Production of haloacetyl halides.—E.I. Du Pont de Nemours & Co. April 7, 1944. 581,278.

Methods of and apparatus for the combustion of gaseous fuel.—H. J. C. Forrester. (Selas Corporation of America.) July 13, 1944. 581,091.

Curing of polymeric organic materials.—W. Furness, L. E. Perrins, W. F. Smith, and I.C.I., Ltd. Feb. 10, 1943. 581,144.

Production of agglomerates of carbonaceous material.—Gas Light & Coke Co., N. E. Siderfin, R. S. Chaplin, H. W. Cartwright, and C. H. Lewis. May 8, 1942. (Addition to 577,792.) 581,133.

Manufacture of basic esters and amides of α-substituted aryloxy acetic acids.—J. R. Geigy A.G. July 30, 1943. 581,230.

Production of aryl derivatives of trichlorethane. Geigy Co., Ltd., I. E. Balaban, and R. D. Calvert. Oct. 5, 1944. 581,156.

Method for adhesively uniting materials or articles.—D. A. Harper, and I.C.I., Ltd. May 29, 1942. 581,134.

Preservation of rubber and the like.—I.C.I., Ltd. July 30, 1943. 581,099.

Production of organic fluorine compounds.—I.C.I., Ltd. Aug. 11, 1943. 581,254.

Chemical immersion heaters.—I.C.I., Ltd., and W. A. Caldwell. March 24, 1942. 581,129.

Vulcanisable compositions and methods of making the same.—H. W. K. Jennings. (Wilmington Chemical Corporation.) June 15, 1944. 581,089.

Synthetic resins.—Kodak, Ltd. (Eastman Kodak, Co.) Aug. 11, 1944. 581,255.

Apparatus for producing fire extinguishing foam.—National Foam System, Inc. March 12, 1943. 581,206.

Bonding cured olefin-polysulphides and related sulphur-containing plastics.—W. J. S. Naunton, W. E. Roberts, J. T. Watts, and I.C.I., Ltd. Sept. 2, 1942. 581,137.

Process for the manufacture of alkyl sulphates.—Nicholas Proprietary, Ltd. Dec. 13, 1943. 581,115.

Copolymers.—Pittsburgh Plate Glass Co., and F. J. Cleveland. (Pittsburgh Plate Glass Co.) April 1, 1942. 581,170.

Liquid control apparatus.—C. A. Pugh, D. G. Booth, and Plessey Co., Ltd. (Cognate applications.) Nov. 12, 1942. Addition to 577,311.) 581,140.

Process for dyeing or colouring cellulose esters or cellulose ethers.—Soc. of Chemical Industry in Basle. Oct. 15, 1941. (Cognate applications 14333/42 and 14334/42.) 581,139.

Process for the production of ethyl benzene.—Standard Oil Development Co. July 30, 1942. 581,145.

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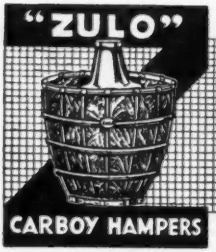

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